Technical Document

Niagara$^{AX-3.x}$ CCN Driver User Guide

1 Objective

The Carrier Communication/Comfort Network which shortly known as CCN driver provides the components necessary to integrate CCN devices and data into the Niagara environment. The CCN Driver is made up of three primary components: 1) The CCN Network; 2) The CCN Device and, 3) a collection of Niagara objects to "shadow" I/O and variables in the CCN network. This is a serial driver.

1.1 The CCN Network

The CCN Network component is a container object used to track the status of the entire CCN, track and perform time synchronization between the CCN system and the Niagara system, and provide support for automatically creating Niagara shadow objects by "learning" devices or controllers within the CCN.

1.2 The CcnDevice

The CCN Device component is a container object used to track the status of a CCN device, track and perform time synchronization between the CCN device and the Niagara system, and provide support for automatically creating Niagara shadow objects by "learning" tables within the CCN device.

1.3 Ccn Shadow Objects

The CCN driver provides support for several different types of data (much of which is accessible via the CCN system):

- CcnTableGroup: A container within which to organize CcnTable shadow objects
- CcnPicTable: A shadow object for the CCN PIC Table type
- CcnPocTable: A shadow object for the CCN POC Table type
- CcnDataTable: A shadow object for the CCN DataTable type
- CcnDataTablewithTimeSchedule: A special shadow object for the CCN DataTable time schedule type that can be represented either in tabular form as other tables are or graphically as a time schedule
- CcnFidTable: A shadow object for the CCN FidTable type
- CcnFidTablewithTimeSchedule: A special shadow object for the CCN FidTable time schedule type that can be represented either in tabular form as other tables are or graphically as a time schedule
- CcnAHTable: A shadow object for the CCN Alarm History Table type
- CcnInputProxy: Shadows the behavior of the CCN Input Point (under a CcnPicTable).
- CcnOutputProxy: Shadows the behavior of the CCN Output Point (under a CcnPicTable, CcnDataTable CcnDataTablewithTimeSchedule, CcnFidTable or CcnFidTablewithTimeSchedule).

For more clarity on CCN hierarchy refer section 6 "CCN ARCHITECTURE" of this document.

2 Niagara AX platform

The CCN driver functions either on Windows operating systems, starting with Window 2000 Service Pack 3 and beyond or on QNX operating system. This means the station must run on a Win-32 based platform, such as a JACE-NXS or -NX, AX Soft JACE, or a PC especially licensed for the CCN driver or in hard JACE like JACE-2, -4, or -5 and -6 series controller.

Note: This driver supports the single CcnNetwork trunk per station.

3 Quick Start

This section briefly describes how to start with Niagara AX CCN driver.

- Create a station from Niagara workbench and do the following.
- Open the "**ccn**" palette and find the CCN Network object.
- Paste a **CcnNetwork** object under the driver's node in your station.
  From CCN network's "**Ccn Network View**" edit the bus and element ranges.
  Enter the correct comm. port into the field Comm Port.

Note: User should enter only the available ports on a JACE.

- Open the **CcnDeviceManager** view by double-clicking the CcnNetwork object just added to the station.
  - Click the "**Discover**" button to discover the devices which are available under CCN Network.
  - Select and add the CCN device/s you wish to integrate.
- Once a device/s is added, navigate to the "**points**" folder under the device and double click the point's folder to display the CCN "**Table Manager"** view.
  - Click the "**Discover**" button to discover the tables available under a particular device
  - Select and add Tables to the database. The tables will be added in categorized manner.
- Once the table group/s is added, navigate to the table under a particular table group. The table can be of type PIC/POC/FID.
  For a PIC table do the following
  Double click on PIC table. It loads the "**Point List Manager**" view.
  - Click the "**Discover**" button to discover the points which are available under that PIC table.
  - Select and add the CCN point/s you wish to integrate.

  For a POC table do the following
  Double click on POC table. It loads the "DataTableManager" view.
  - Click the "**Discover**" button to discover the **Data Tables** which are available under that POC table.
  - Select and add the CCN Data Table/s you wish to integrate.
  - Double click on DataTable which is added under POC table. It loads the "**Data Point List Manager**" view
  - Click the "**Discover**" button to discover the points which are available under that Data table.
  - Select and add the CCN point/s you wish to integrate.

4 Operating Modes in CCN

The CCN Driver supports one of two operating modes. The default mode must have feature “ccnl” in the license file. For the Extended mode the license feature must include both “ccn” and “ccnl” in the license file. The Extended mode driver is not offered for sale at this time.

“ccnl”------- ccn standard license.
“ccn + ccnl” ------ ccn extended license

Here’s the major difference between the Standard and Extended versions of the CCN driver:

CCN Standard (license feature ccnl)

- Read/write/force/auto of display table entries
- Read/write set point table entries
- Read/write time schedule table entries
- Discovery (learn/create) support for display, set point, time schedule tables
- Upload/download support for display, set point, time schedule tables
- Alarm handling (display and logging)
- Broadcast date/time, Broadcast acknowledger, Alarm broadcast acknowledger support
- Device status support

CCN Extended (license feature ccn)
- All the above plus
- Additional support for Read/write/force/auto maintenance table entries
- Additional support for Read/write configuration tables
- Additional support for Discovery (learn/create) support for maintenance and configuration tables
- Upload/download support for maintenance and configuration tables

5 Configure CcnNetwork

To add and configure the CcnNetwork, perform the following main tasks:

- Add a CCN network
- 5.2 Discover and add

5.1 Add a CcnNetwork

Use the following procedure to add a CcnNetwork under the station’s Drivers container.

To add an CcnNetwork in the station

1. Double-click the station’s Drivers container, to bring up the Driver Manager.
2. Click the New button to bring up the New DeviceNetwork dialog. For more details, see “Driver Manager New and Edit” in the User Guide.
3. Select “CcnNetwork,” number to add: 1, and click OK.This brings up a dialog to name the network.
4. Click OK to add the CcnNetwork to the station.

You should have a CcnNetwork named “CcnNetwork” (or whatever you named it), under your Drivers folder.

5.2 Discover and add CcnDevices

To discover and add CCN devices do the following

1. Go to the “Ccn Network View”. Enter the values for properties First Bus No,Last Bus No, Low Eelement No and High Element No.
2. Double-click the **CcnNetwork** or right-click the CcnNetwork and select **Views >CcnDeviceManager.**
This brings up the Ccn Device Manager.
3. Click on “**Discover**” button from CcnDeviceManager.
4. It discovers the available CcnDevices which are in the given range.
5. Select the discovered devices and click on “**Add**” button. It adds up the devices to station database.

6 CCN Architecture

Essentially, CCN uses the standard Niagara AX network architecture. Under a CcnNetwork it will have CcnDevice. Normally drivers will have direct points under “**Points**” extension. But Ccn will have different table groups under “Points” extension and table resides under table groups. Actual points reside under table. Diagrammatically the hierarchy would be as follows.

```
CcnNetwork
    |→CcnDevice
            |→Points (Point Device Ext)
                    |→TableGroup1
                            |→PIC Table1
                                    |→Control Point1
                                    |→Control Point2
                                    :
                                    : Control Point n
                            |→PIC Table2
                                    |→Control Point
                            |→POC Table1
                                    |→DataTable1
                                            |→Control Point1
                                            |→Control Point2
                                    |→Data Table2
                                            |→Control Point
                            |→POC Table2
                                    |→DataTable1
                                            |→Control Point1
                                            |→Control Point2
                                    |→Data Table2
                                            |→Control Point
                    |→Table Group2
                    :
                    :
                    :
                    |→Alarm History Group
                        |→ Alarm Table
                                |→ Alarms
```

Ccn driver architecture

7 CCN Network

For CcnDriver CcnNetwork is the top-level container component in a station. The simplest way to add a CcnNetwork is from the “Driver Manager” view, using the new command. Or, you can simply copy the CcnNetwork from the “CCN” palette into Drivers.

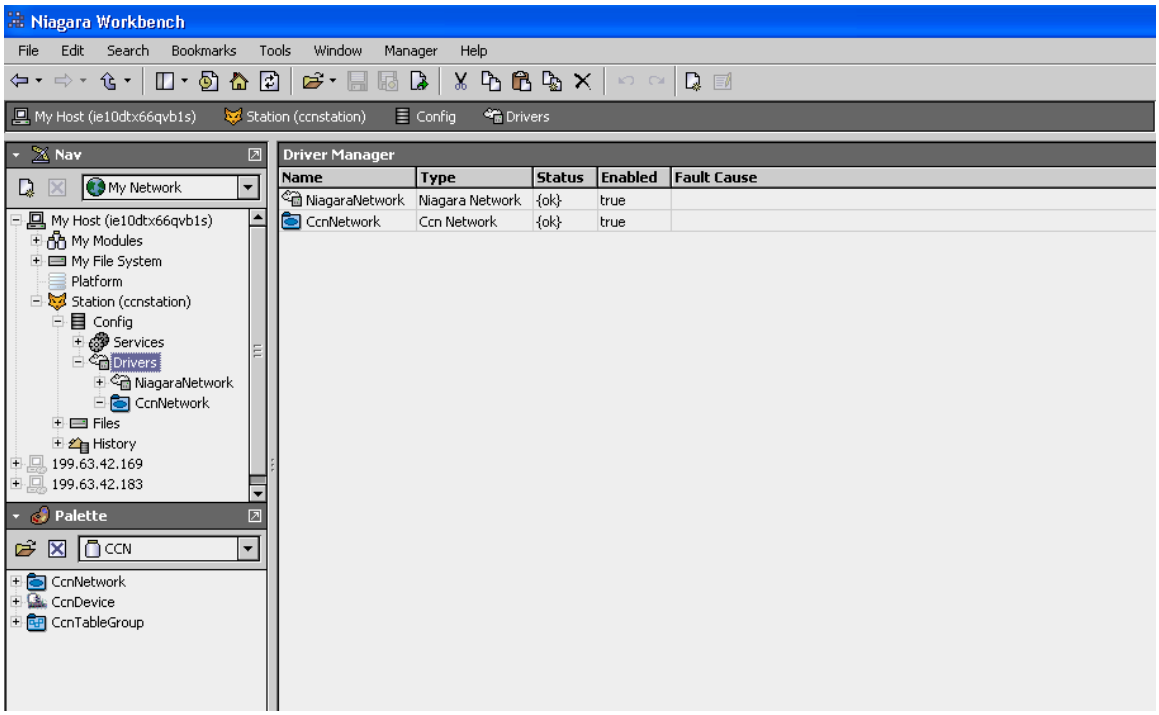


Figure1: CcnNetwork from Driver Manager View

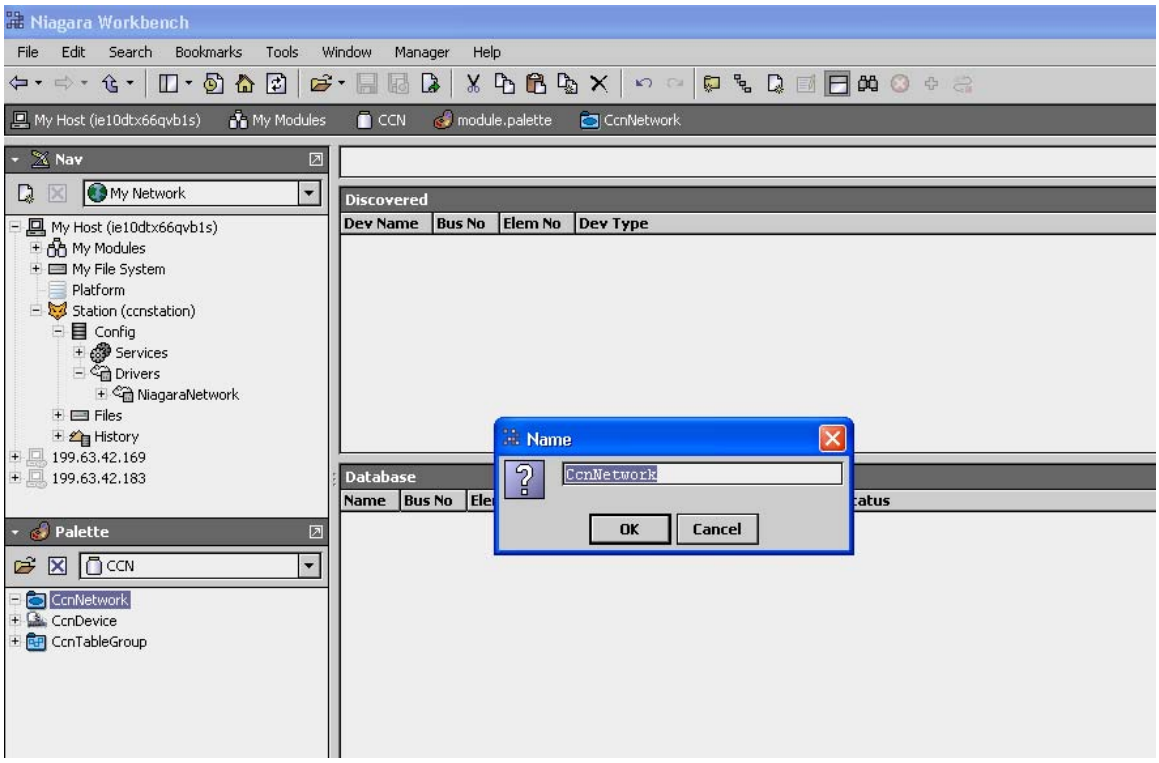


Figure2: CcnNetwork from palette

7.1 CCN Network status notes

As with most other drivers, the status of a CcnNetwork is either the normal “ok” or less typical “fault” (fault might result from licensing error). The Health slot contains historical timestamp properties that record the last network status transitions from ok to any other status. The “Fault Cause” property further explains any fault status.

7.2 CCN Network monitor notes

The CcnNetwork’s monitor routine verifies to Ping the child Ccndevices with ping frequency duration. For general information, see “About Monitor” in the User Guide.

7.3 CCN Network views

The CcnNetwork’s default view is Ccn Device Manager, equivalent to the Device Manager in most other drivers. Use this view to discover and add Ccn Device components to the station. Another view is Ccn Network View which is equivalent to property sheet.

Other standard views are also available on the CcnNetwork. However, apart from the Ccn Device Manager, we typically access only its Ccn Network View.

7.4 CCN Network Properties

retryCount:	Indicates how many additional times a request for data will be sent to the CCN if the first attempt fails or the answer contains an error. The recommended setting for this driver is “1”, which allows for up to 2 attempts before declaring a communications error.
responseTimeOut(sec)	Indicates how long the driver will wait for a response before declaring the CCN non-responding. On a poll/response sequence, if the response does not return within the responseTimeOut period, a retry is attempted. If retryCount has been exhausted, a communications failure is declared. Recommended setting is 2-5 seconds
clearBridgeList	During the learn process, the user can specify that the bridges list be cleared and start over.
createTables	During the create process, the user can specify that CcnTables are automatically created for all tables under all devices that have been selected for CcnDevice creation.
autoCreatePoints	Boolean value, “true” if station is to auto create points when Pic and or Data and or FID IO tables are created. Only supports creation of points under Status Display (11H) and FID Status table (501H).
bridges	A list of the known bridge addresses
learnStatus	Status of network level learn command (busy, idle, or error).
firstBusNo	The starting bus address to be used in the learn process.
lastBusNo	The ending bus address to be used in the learn process.
lowElemNo	The starting element address to be used in the learn process.
hiElemNo	The ending element address to be used in the learn process.
deviceLearnCount	Number of devices found during latest learn process
displayMetric	At any time the user can change the units display of all values between Metric and Imperial.
UnsolicitedReceiveHandler	Handler for unsolicited messages.
alarmAcknowledger	Checkbox, select if JACE to be the CCN Network alarm acknowledger, de-select if not.
broadcastAcknowledger	Boolean value, select “true” if JACE to be the CCN Network broadcast acknowledger, “False” if not.

timeSyncStat	Reports if time sync service is started or stopped.
timeBroadcaster	Checkbox, select if station is to be the CCN Network time broadcaster.
timeSyncDisplayDots	Normally set to False, setting to True will enable a “T” character to displayed in the diagnostic output every timeSync cycle.
busAddress	The CCN bus address that the Niagara Station is connected to (generally the primary bus, bus 0).
elemAddress	The CCN element address on the busAddress that the Niagara Station is assigned (generally a high element number just below the broadcast address range, typically 230 - 239). Do not use same address assigned to Comfort Works application that you might decide to tunnel for setup and configuration.
tunnelEnable	checkbox, select to enable tunneling for the JACE. Since tunneling consumes station resources in order to maintain IP communications to ComfortWorks stations, it is recommended that this feature be disabled unless tunneling of ComfortWorks is required. It is not recommended to leave tunneling enabled “just in case” one might someday wish to tunnel a ComfortWorks.
CcnTunnelHelper	Tunnel Helper component which contains tunnel related properties as mentioned below
tunnelRxDisplayDots	Normally set to False, setting to True will enable a “B” character to be displayed in the diagnostic output every tunnel-receive cycle.
tunnelTxDisplayDots	Normally set to False, setting to True will enable a “U” character to be displayed in the diagnostic output every tunnel-transmit cycle.
tunnelRxDebugOn	Selects whether tunnel-receive debug is turned on or off. If set to "True", protocol specific debug text will be generated and sent to the administrator console window whenever tunnel data is received by the JACE from a ComfortWorks.
tunnelTxDebugOn	Selects whether tunnel-transmit debug is turned on or off. If set to “True”, protocol specific debug text will be generated and sent to the administrator console window whenever tunnel data is transmitted to a ComfortWorks from the JACE.

tunnelRxRetryCount	When the JACE sends tunnel data to a ComfortWorks, it expects an acknowledgement of receipt from the ComfortWorks. In the event that the JACE sends tunnel data to a ComfortWorks but does not receive any such acknowledgement, this parameter defines the number of times that the JACE should resend the packet of data. The recommended setting for this property is two retries.
tunnelRxRetryTimeout (ms)	When the JACE sends tunnel data to a ComfortWorks, it expects an acknowledgement of receipt from the ComfortWorks. This parameter defines the number of milliseconds that the JACE should wait for the acknowledgement of receipt from the ComfortWorks. If the acknowledgement of receipt is not received during this interval of time after transmission, then the JACE will retry the number of times specified by the property tunnelRxRetryCount. The recommended setting for this property is 1000 milliseconds.
lowLevelDebug	Boolean property, “true” if JACE to be the CCN Network broadcast acknowledger, false if not. If selected, low level native code specific debug text will be generated and sent to the administrator console window.
lowLevelDebugMask	Default is 0. Do not use this property without the assistance of Tridium Engineering (in an effort to isolate a specific problem you have reported).
commPort	Comm port through which communications to the CCN will take place. User should enter one of the available port on JACE to which CCN trunk has connected to.
HostbaudRate	Set to match the baud rate of the bus of the CCN Network to which the JACE is connected, default is 9600.

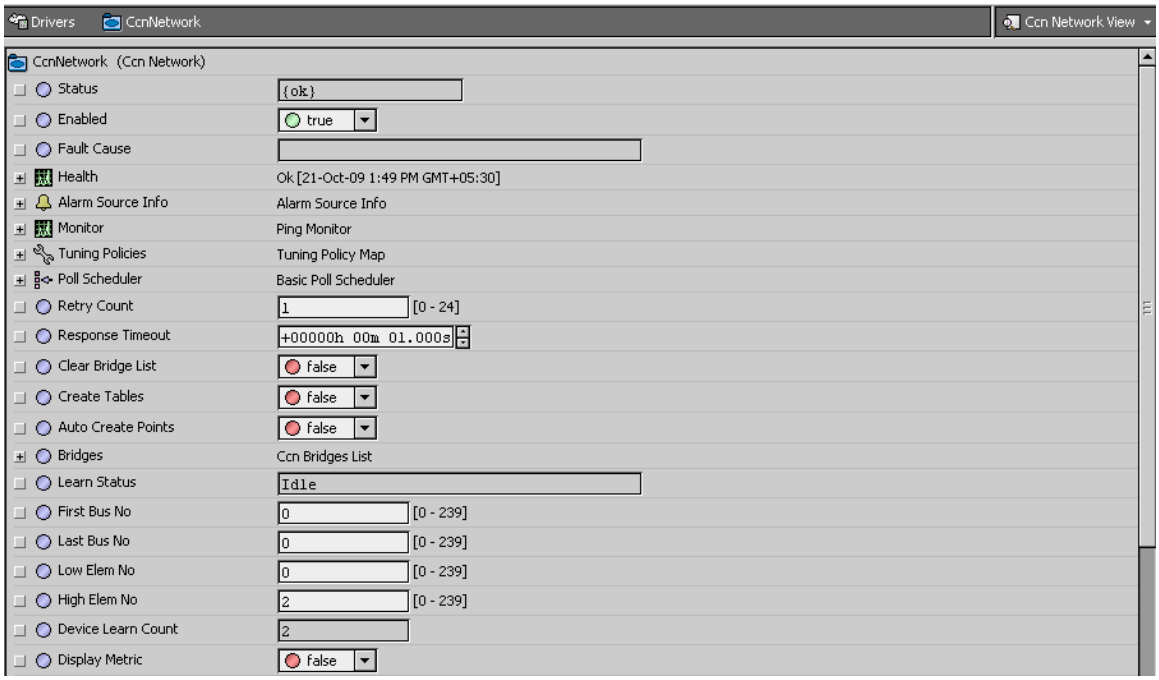


Figure 3 Ccn Network View

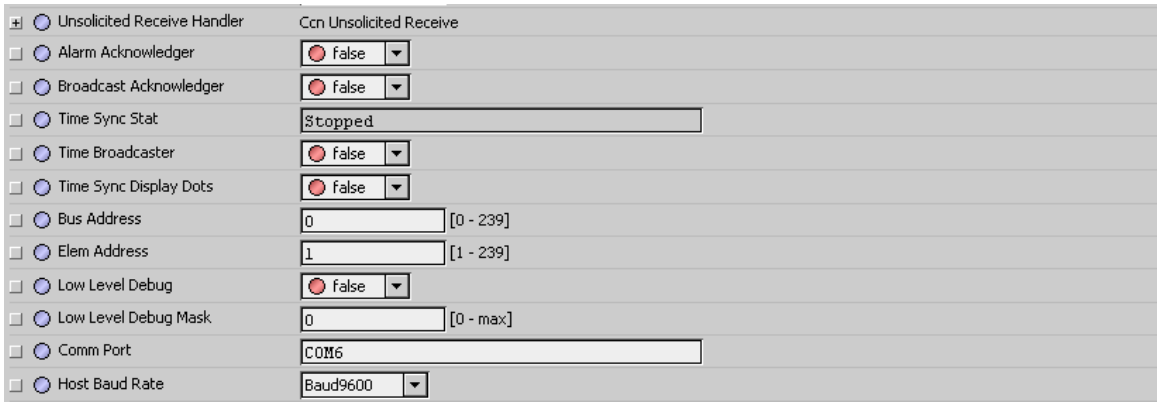


Figure 4 CcnNetwork Property sheet

8 Ccn Device Manager

The **Ccn Device Manager** is the default view when you double-click on a Ccn Network in the Nav tree. This manager view provides a quick and easy way to display and learn Ccn devices that are on the Ccn network:

The Ccn Device Manager is the default view for any Ccn Network container. The Ccn Device Manager is a table-based view, where each row represents a unique device. When building a network in the station, you use this view to create, edit, and delete device-level components.

Below is an example Ccn Device Manager view for discovery and adding devices to station database.

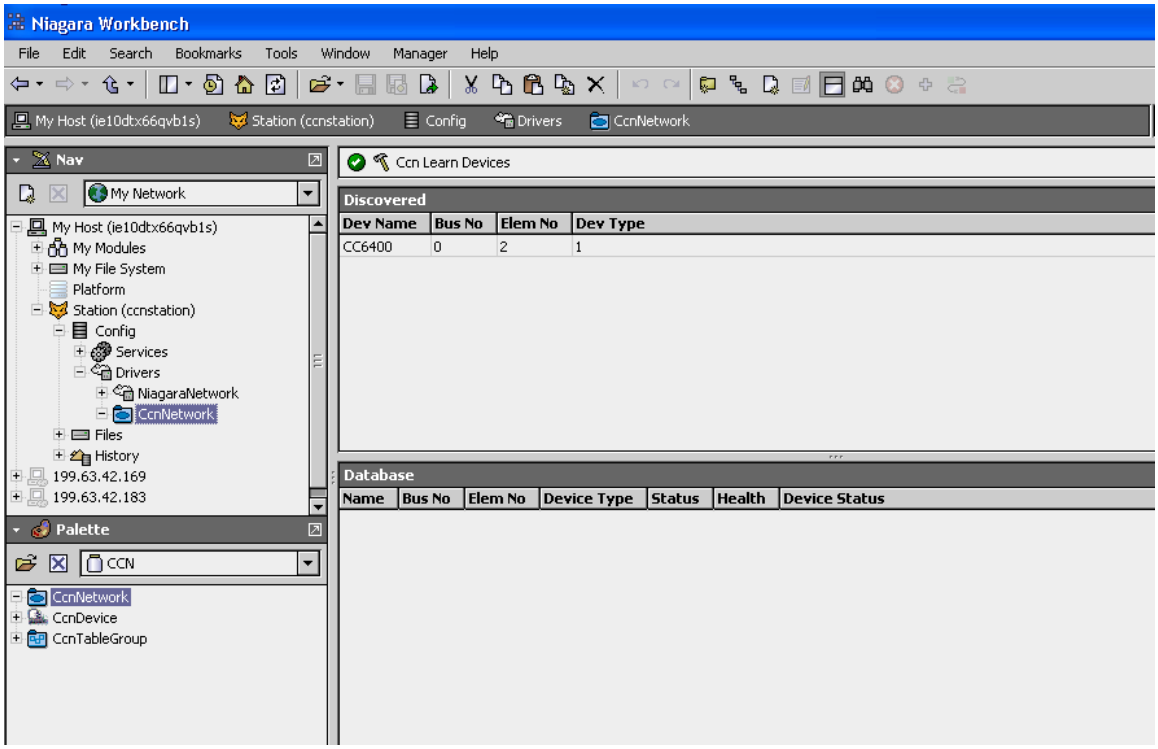


Figure 5: CCN device discovery from Device Manager

The Ccn Device Manager consists of either one or two main panes, depending on whether or not the “Discover” button has been clicked. The view above shows a typical Ccn Device Manager view.

The “New Folder”, “New”, and “Edit” buttons are not unique to the Ccn Device Manager, and are explained in the “Niagara AX User’s Guide” in the “Driver Architecture” section. The “Match” button is not used for the Ccn driver.

The “Discover” button does implement functionality that is unique and tailored to discovering Ccn devices. By clicking the “Discover” button, the “learn” mode of the manager is invoked (the panes will be split, and a “discovery” table will be displayed in the top pane) .

The progress of the discover devices process can be viewed in “learnStatus” property from Ccn Network View.

Once the discovery job is complete, the top half-pane of the point manager will display a table of devices discovered (see following figure).

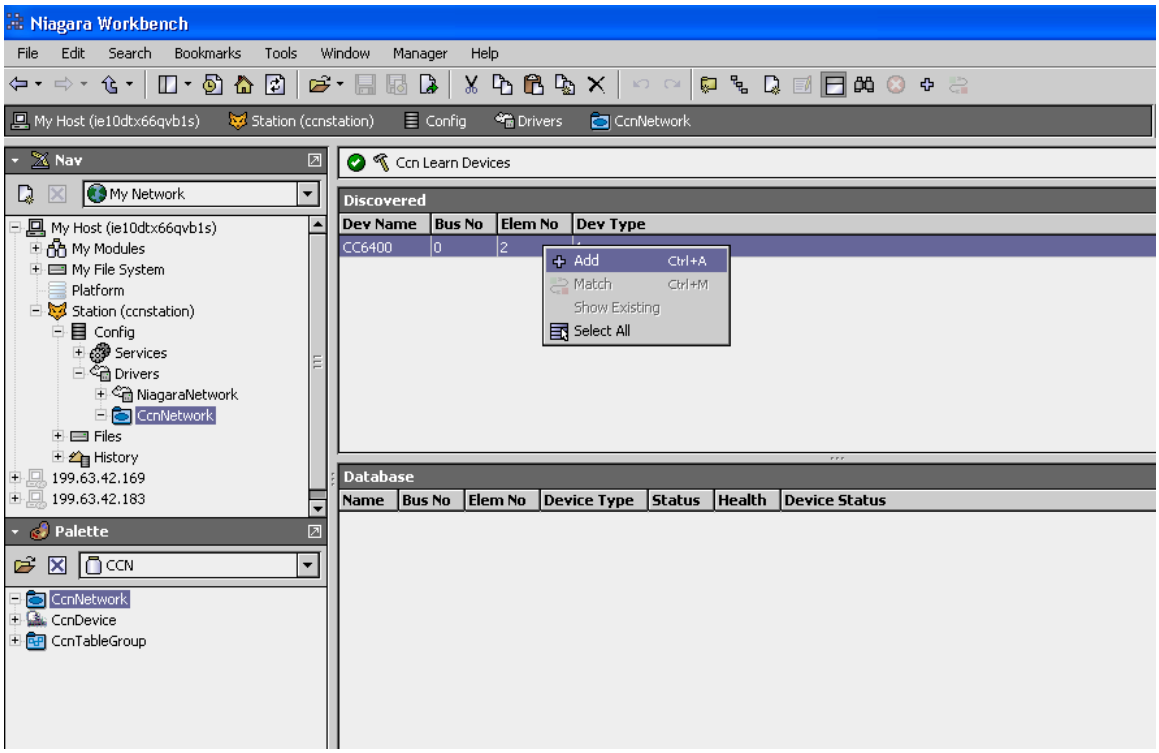


Figure 6: Adding CcnDevice to station database.

If you highlight one or more rows in the top “Discovered” pane, then “Add” button becomes active. You can now add the selected devices to the station database by clicking the “Add” button.

Note: As in Normal drivers, the CCN driver doesn’t open a dialog window before adding the learned entry to station database. Simply it adds the entry to station database. If user wants to edit anything (deviceName/busNum/elementNum), user can do the same by clicking on “Edit” button

If user selects the property “createTables” as “true” and “autoCreatePoints” as “true”, then tables will be discovered and the points which are under “Status Display” group will be added along with the device.

Figure 7: Auto create Tables and Points

The user can add a ccn device by using the “new” button from the Ccn Device Manager.

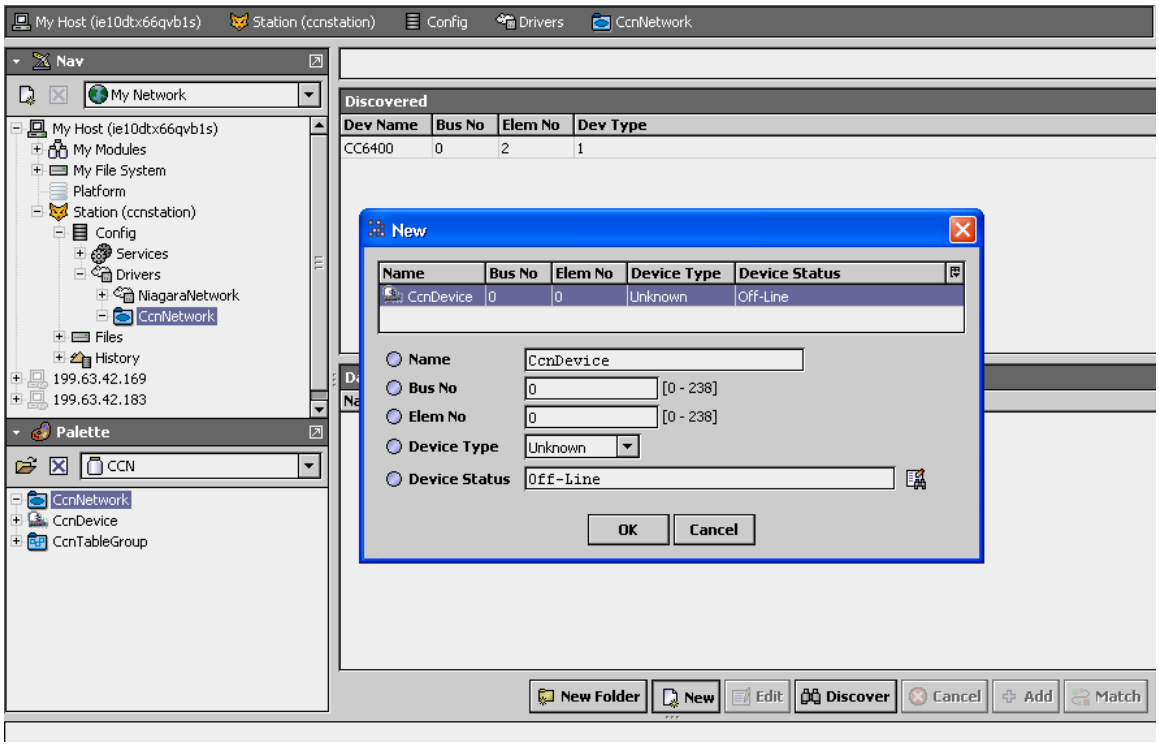


Figure 8: Adding a CcnDevice by "New" option from CcnDeviceManager

9 Ccn Device

A CcnDevice object can only be added to a CcnNetwork container.

A CcnDevice is most conveniently added during the CcnNetwork's Device Manager Creation process.

Alternatively, a CcnDevice may be added to an existing station using the "New" button on Device Manager. To do so, drag and drop the CcnDevice object from palette to Ccnnetwork under station. This will add the CcnDevice to the CcnNetwork. If this approach is taken, the user will need to go to the CcnDevice Config tab and set the busNo, elemNo properties to the actual address of the device to be shadowed. Then, a **"fetch"** action on device will retrieve additional needed device information like pic type , part no, model no etc.

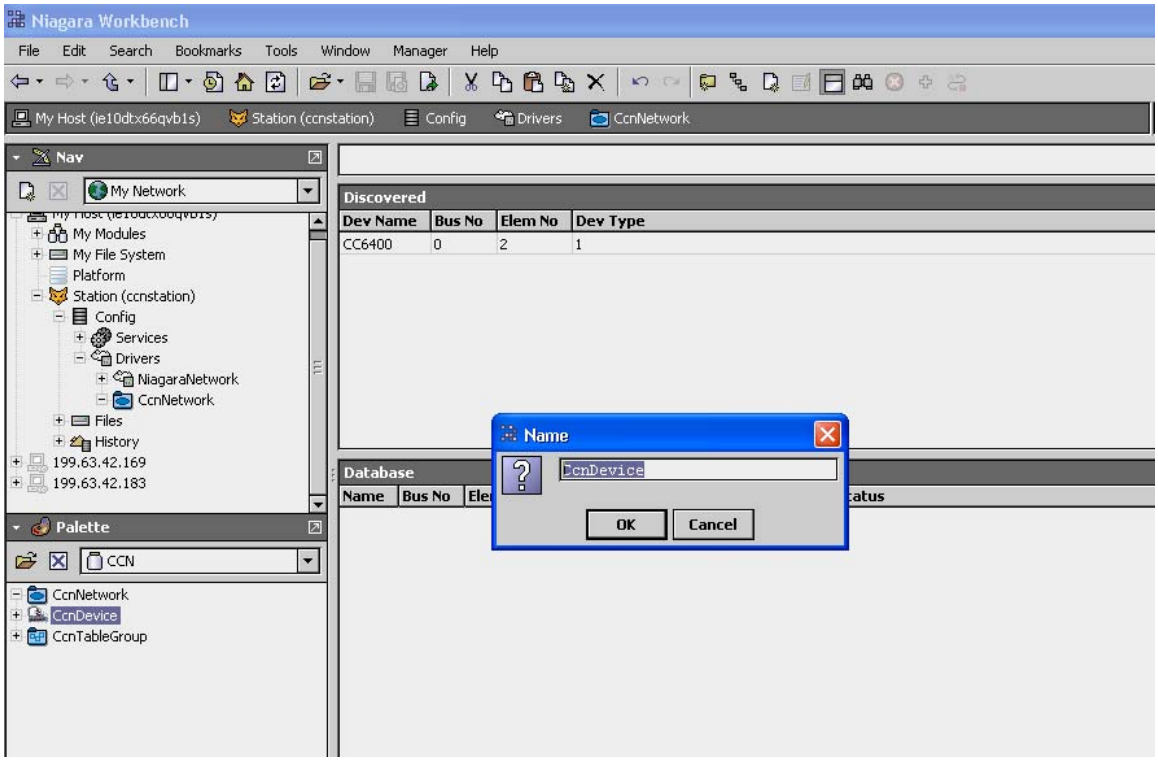


Figure 9: Adding CcnDevice from the palette

9.1Ccn Device Status Properties

- **Status**
  Status of CcnNetwork communications to this CcnDevice. Possible status flags include:
  - Ok - Normal communications, no other status flags.
  - Disabled - Enabled property is set to false, either directly or in CcnNetwork.
  - Down - Error communicating to the CcnNetwork.
- **Enabled**
  Either true (default) or false. Can be set directly or in parent CcnNetwork. See Status disabled description above.
- **Health**
  Contains properties including timestamps of last “ok” time and last “fail” time, plus a string property describing last fail cause.
- **Fault Cause**
  If status has fault, describes the cause.

9.2 Ccn Device Properties

busNo	The bus address of the device.
elemNo	The element address of the device.
deviceName	Retrieved from the device with the fetch command

picType	Retrieved from the device with the fetch command.
applicationVersion	Retrieved from the device with the fetch command
deviceStatus	Shows whether the device is online or offline.
deviceDescription	Retrieved from the device with the fetch command
location	Retrieved from the device with the fetch command
partNo	Retrieved from the device with the fetch command.
modelNo	Retrieved from the device with the fetch command.
serialNo	Retrieved from the device with the fetch command.
referenceNo	Retrieved from the device with the fetch command.
platformNo	Retrieved from the device with the fetch command.
osVersion	Retrieved from the device with the fetch command.
deviceType	Shows whether the device is of type “Bridge” or “NonBridge”
primaryBaudRate	Retrieved from the device with the fetch command.
secondaryBaudRate	Retrieved from the device with the fetch command.
maxTableNumber	The CcnDevice’s TableListManager learn process will attempt to learn the maxTableNumber of a device. This is beneficial, because it will shorten the learn process Some devices do not support the technique used to automatically learn the maxTableNumber, so the user is permitted to enter this value if it is known.
tableLearnCount	Number of tables learned/discovered during latest discovery process.
learnStatus	Status of controller level learn command (busy, idle, or error).
tableCreateCount	Number of tables created during latest create process
deviceTime	The latest device date and time as returned in response to a query of the device’s Date Time Table sent by the ping process. Device date and time are not used by Niagara for any purpose other than a short and quick message to perform a device status check, so if they are not current and the next property (devicePingStatus) indicates "skipped, not needed since child object communicated since last ping", that is good sign in that adequate successful comm activity is occurring and the devicePing that updates deviceTime is not required to run.
devicePingStatus	The success or failure status of the device ping. The ping process alternately retrieves the date and the time block. A success messages would be: "succeeded and parsed date from ping message" "succeeded and parsed time from ping message"

"skipped, not needed since child object communicated since last ping"
"received date response but with NAK "
"received time response but with NAK "

** The NAK response merely means the specific device does not maintain date and/or time.

Failure messages would be:
"skipped, device is out of service"
"failed, no response to date request"
"failed, no response to time request"
"could not complete last ping: "

isEnhancedVersion	Indicates if JACE license designates this device as enhanced or not. If enhanced, access to configuration table data is supported. If not enhanced, access is limited to Display, Setpoint, and Time Schedule Data.

The CcnDevice's property sheet

9.3 CcnDevice property sheet for Status Properties

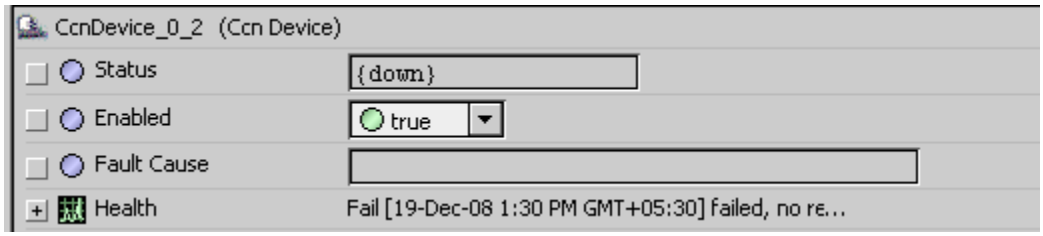


Figure 10: CcnDevice Property sheet

9.4 CcnDevice Property Sheet

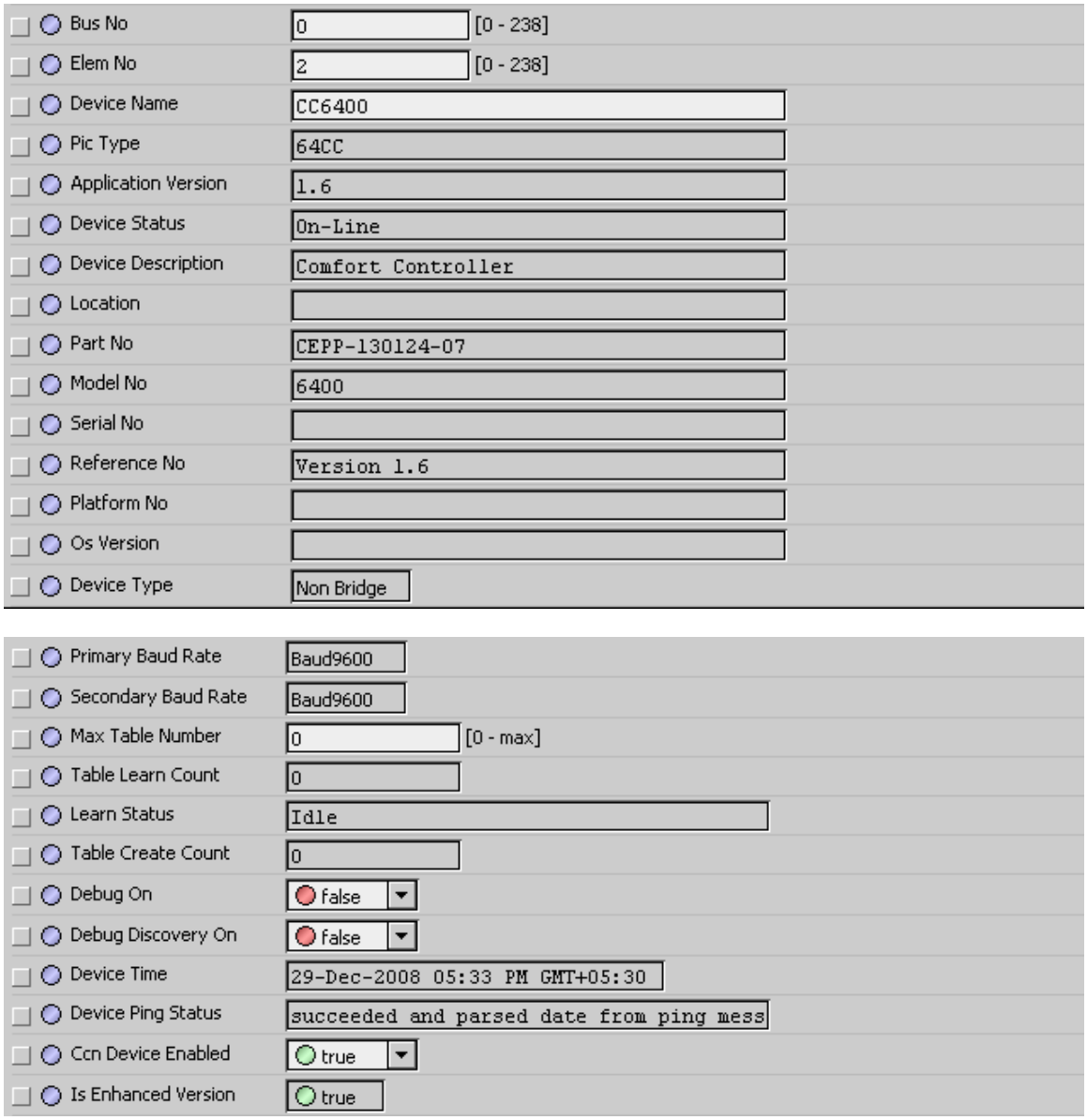


Figure 11: CcnDevice Property sheet

9.5 Table Group selection Properties:

User can select the type of table group he wants to discover. The Table groups which are selected as “true” will be learned in the discovery process. The table groups which are selected as “false” will not be learned in the discovery process.

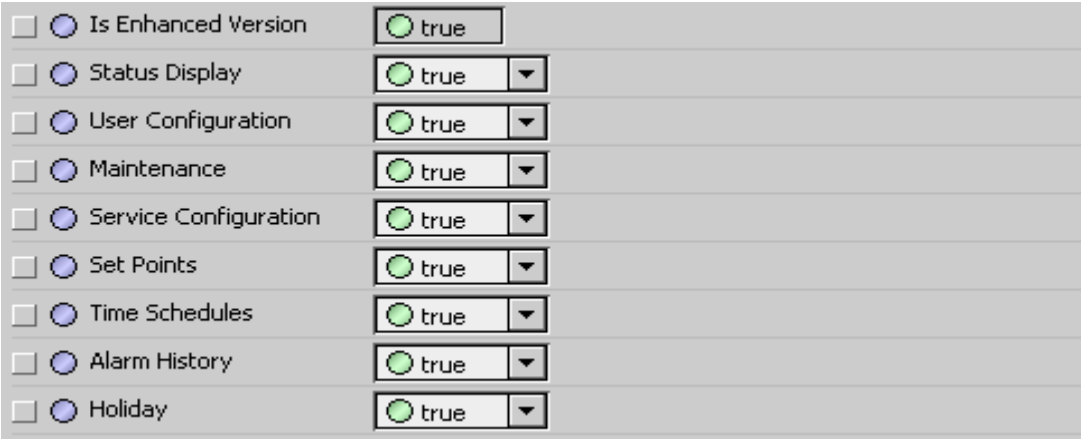
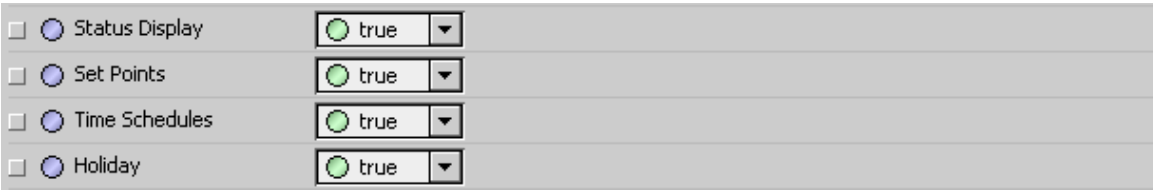


Figure 12: Table Group selection from CcnDevice Property sheet

Following are the Table Groups support by a FID type device



9.6 CcnDevice Actions

Ping: Pings the Ccn device and updates device ping status property.

Upload:

A CcnDevice's CcnPicTables, CcnPocTables, CcnDataTables and CcnFidTables can be uploaded. The upload command is available as an action on the CcnDevice. When invoked, a list of CcnTables blocks are uploaded and all Station resident data is updated to match that which was retrieved from the field device.

Download:

A CcnDevice's CcnPicTables, CcnPocTables, CcnDataTables and CcnFidTables can be downloaded. The download command is available as an action on the CcnDevice. When selected, each non-real-time table's value blocks are constructed from the Station resident data and then downloaded to the field device.
Note: If download the logic to the controller, we don't have clarity on whether the device will work or not. So we couldn't test this feature.

Fetch:

This action will fetch additional information of device when user manually adds a new device with correct bus and element numbers.

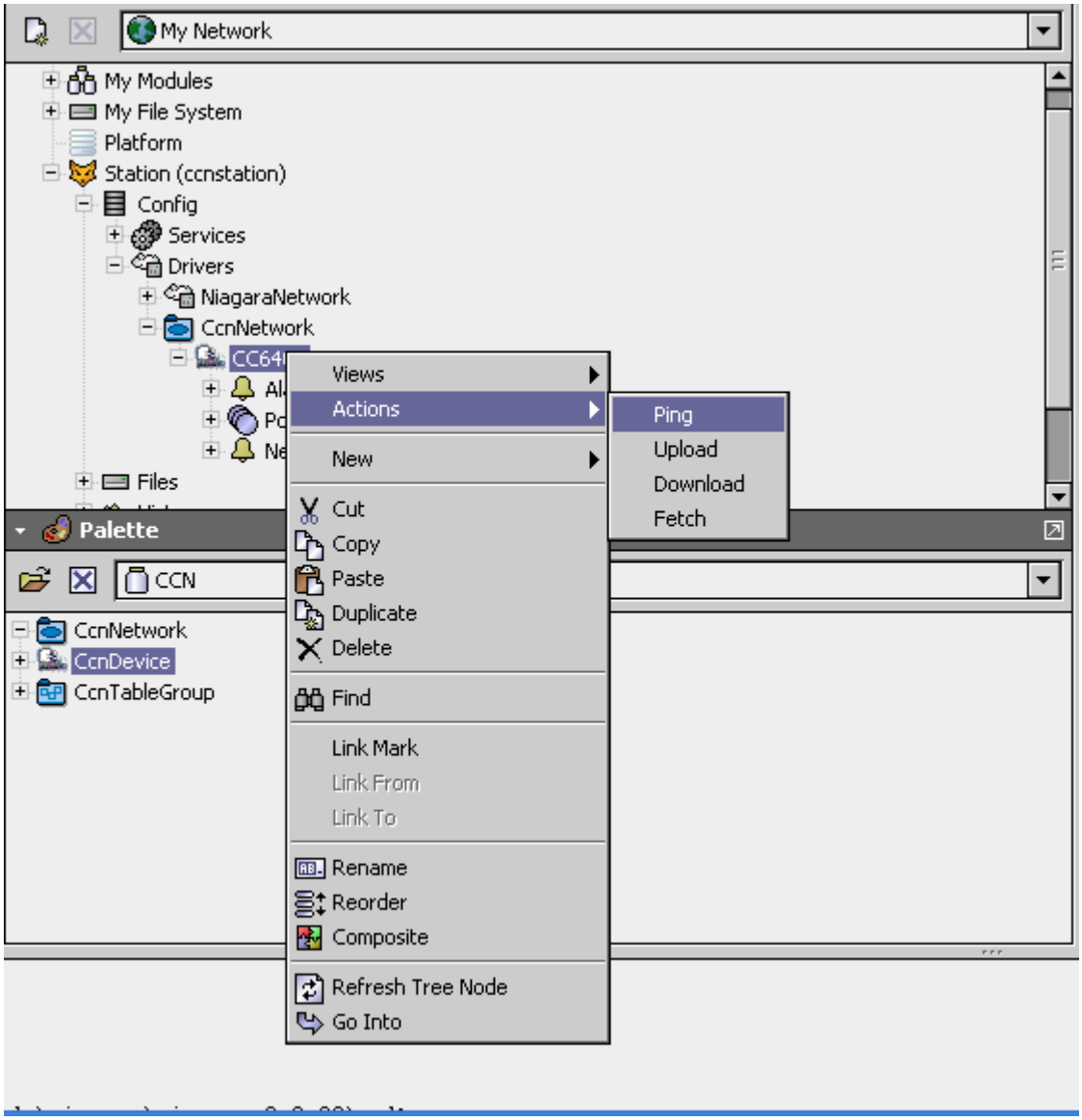


Figure 13 Actions on CcnDevice

10 Ccn Table Manager

The **Ccn Table Manager** is the default view when you double-click on “Point” extension under Ccn Device in the Nav tree. This manager view provides a quick and easy way to display and learn Ccn Tables that are on the Ccn device:

The Ccn Table Manager is a table-based view, where each row represents a unique table. When building a device in the station, you use this view to create, edit, and delete table-level components. Below is an example Ccn Table Manager View for discovery and adding tables to station database.

The Ccn Table Manager consists of either one or two main panes, depending on whether or not the “Discover” button has been clicked. The view above shows a typical Ccn Table Manager view.

The “New Folder”, “New”, and “Edit” buttons are not unique to the Ccn Table Manager, and are explained in the “Niagara AX User’s Guide” in the “Driver Architecture” section. The “Match” button is not used for the Ccn driver.

The “Discover” button does implement functionality that is unique and tailored to discovering Ccn tables. By clicking the “Discover” button, the “learn” mode of the manager is invoked (the panes will be split, and a “discovery” table will be displayed in the top pane) .

The progress of table discovery can be viewed from “learnstatus” property from Ccn Table Manager.
Once the discovery job is complete, the top half-pane of the Ccn Table Manager will display a collection of tables discovered (see following figure).

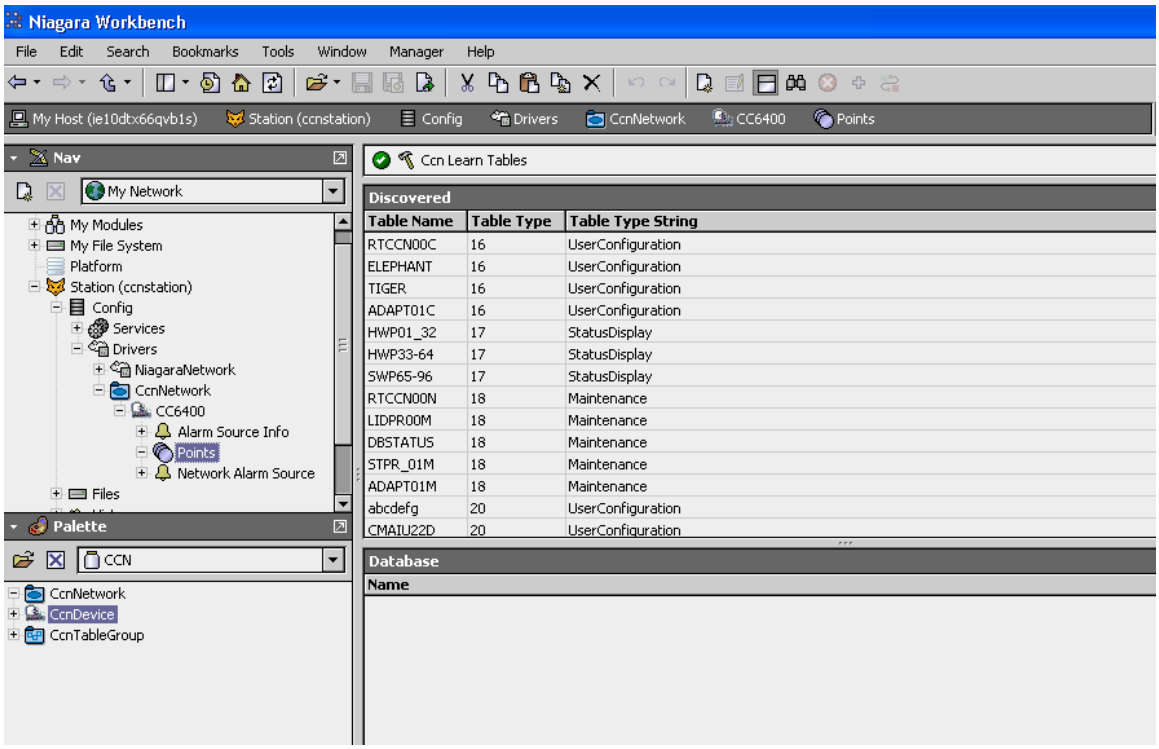


Figure 14: CcnTable Discovery

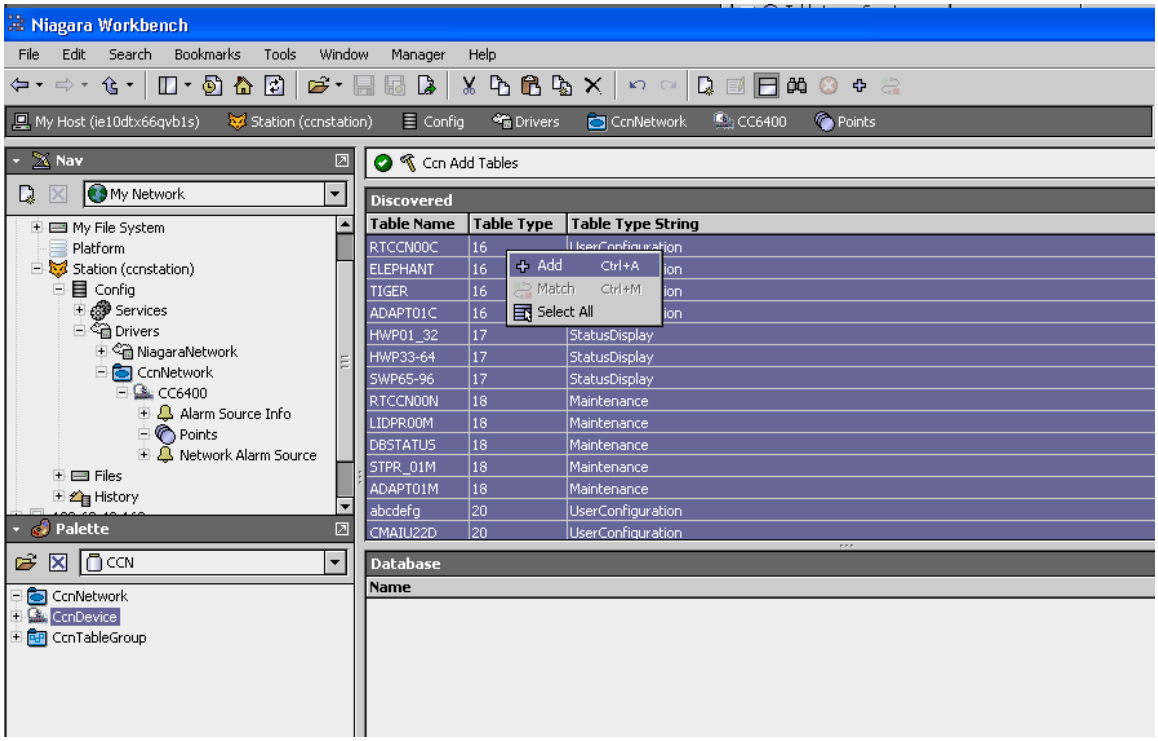


Figure15: Adding CcnTables to station database

Once the user clicks on “Add” all tables will be added in a category manner under a device.

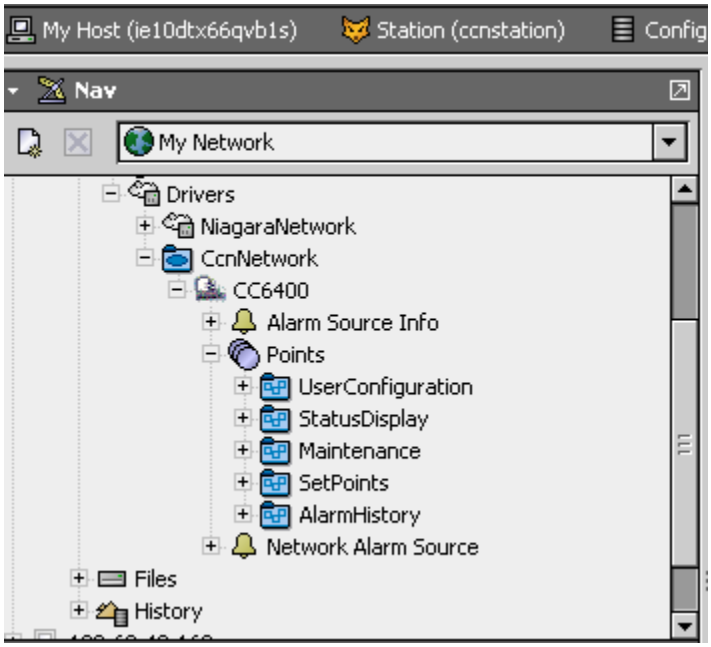


Figure 16: CcnNetwork hierarchy after adding tables to the device.

If the table type is POC table, we can discover the Data Tables under a POC table.

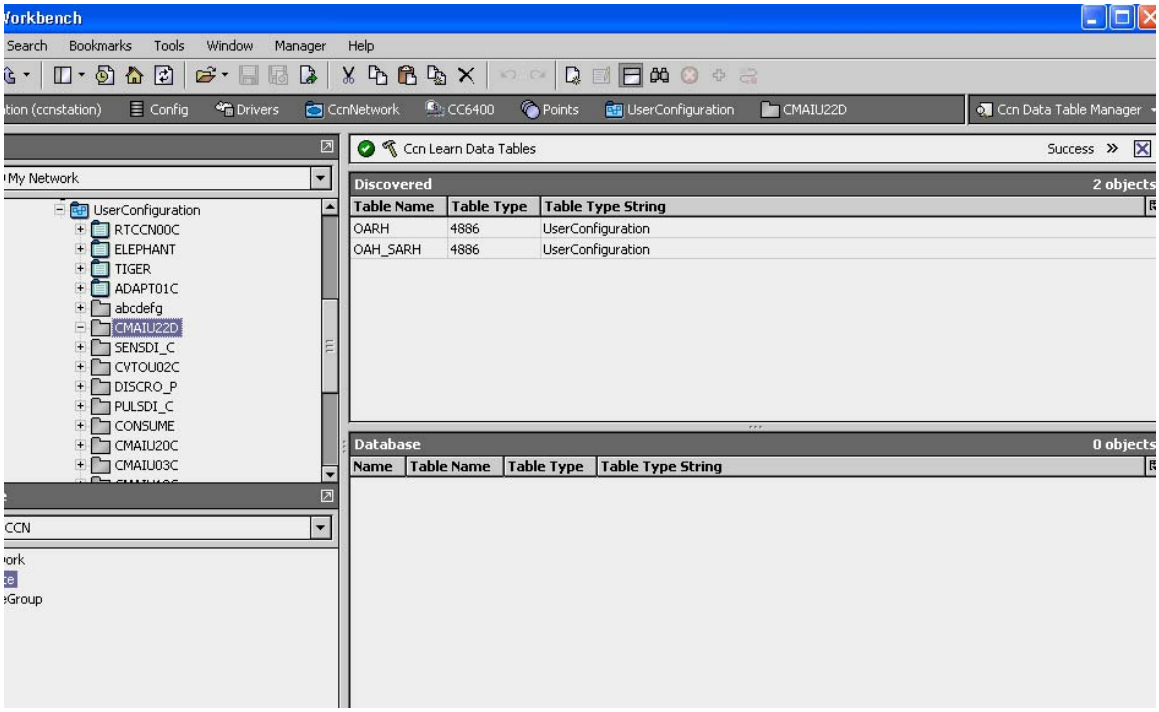


Figure17: CcnDataTable Discovery

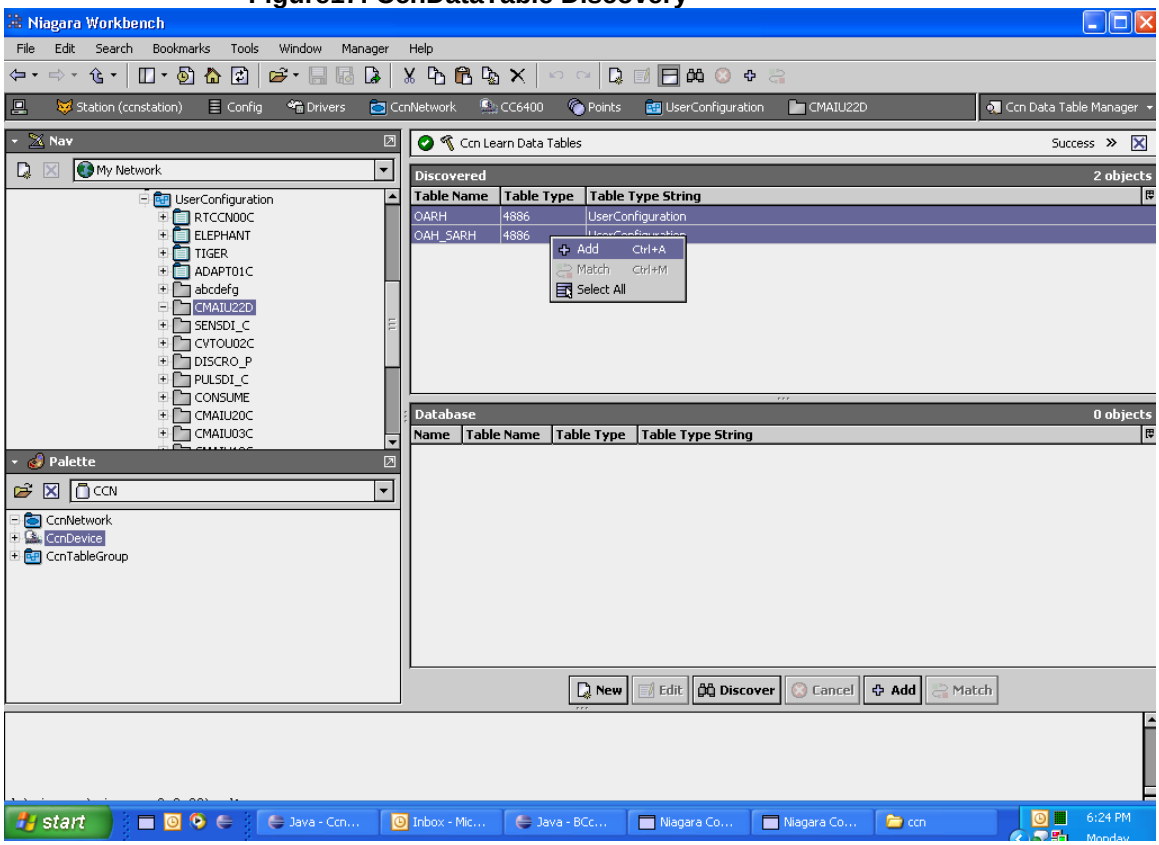


Figure 18: Adding Data Tables under POC table.

11 CcnTable

The collection of CCN shadow table objects model the tables of a CCN controller. The following shadow table objects are provided:

The following shadow tables are provided:

CcnPicTable	Models a single Pic table defined by table type and table instance.
CcnPocTable	Models a single Poc table defined by table type and table instance.
CcnDataTable	Models a single Data table defined by table type and table instance.
CcnDataTableWithTimeSchedule	Models a single Data table with Time Schedule defined by table type and table instance.
CcnAHTable	Models a single Alarm History table defined by table type and table instance.
CcnFidTable	For IO Points table type 501H, one table entry (instance 1) models all IO point tables (up to 64 points - 1 instance of table type 501H per point) For all other Fid table types supported (Time Schedules, Setpoints, Holidays) , Fid Tables model device tables 1 for 1 by table type and table instance
CcnFidTableWithTimeSchedule	Models a single Fid table with Time Schedule defined by table type and table instance.

11.1 CcnTable Configuration

The CcnTable shadow object consists of CcnPicTable, CcnPocTable, CcnDataTable, CcnDataTablewithTimeSchedule, CcnFidTable, CcnFidTablewithTimeSchedule, and CcnAHTable shadow objects.

A CcnPicTable or CcnPocTable or CcnAHTable shadow object can only be added to a CcnDevice container (generally under a CcnTableGroup).

A CcnDataTable or CcnDataTablewithTimeSchedule shadow object can only be added to a CcnPocTable container (generally under a CcnTableGroup).

A CcnFidTable or CcnFidTablewithTimeSchedule shadow object can only be added to a CcnDevice container (generally under a CcnTableGroup)

A CcnTable is most conveniently added during the CcnDevice's or CcnPocTables TableListManager creation process

Alternatively, a CcnTable may be added to an existing station using the copy-and-paste method. To do so:

- From Ccn Table Manager, add a table to table group by using “new” button.
- This will add the CcnTable to the CcnDevice or CcnPocTable
- set the CcnTable tableType and tableInstance properties to the actual type and instance of the table to be shadowed (must enter these in decimal, not hex)
- if table type is set to 501H for Fid IO points, be sure and set the instance to 1
- if the table type is CcnDataTable or CcnDataTableWithTimeSchedule, user must also set the blockNumber
- do a fetch command (on the Menu bar under commands or at the bottom of the view) will retrieve additional needed table information and build the pointList.

Note: Table name “SPSCHPOC” will not support manual addition of table and fetching.

11.2 CcnTable Properties

Table Type	Table’s table type. The valid values are Pic tables (16 {10H], 17 {11H}, 18{12H}, 19{13H}, 23{17H}) Poc tables (20 {14H], 21 {15H}, 22{16H}, 24{18H}) AH tables (67 {43H}) Data tables (> 127)
tableTypeString	The table’s table group type.
tableInstance	Table’s table instance number.
tableNumber	Table’s unique table number.
tableName	Table’s 8 character table name. This is the only property which goes to field device. After changing the table name from property sheet, user should invoke “fetch” action on table. Then the table name will change to the new name given by user. Invalid table name will be treated as “T”. First 8 characters of the name will go to the field device.

Note: User should change the tableName property from property sheet only. Try to avoid renaming the table name from wire sheet, slot sheet etc.
Observation: This operation is controller specific.

tableBlockCount	Table’s block count (generally 10-15).
learnStatus	Status of controller level learn command (busy, idle, or error).

pointLearnCount Number of points found during latest learn process

pointCreateCount Number of points created during latest create process

For a POC table additional properties are

dataTableType type of datatable which resides beneath it.

dataTableLearnCount Number of data tables found during latest learn process

dataTableCreateCount Number of data tables created during latest create process

For a Data Table

dataBlock The data block in the data table where this point data values are located

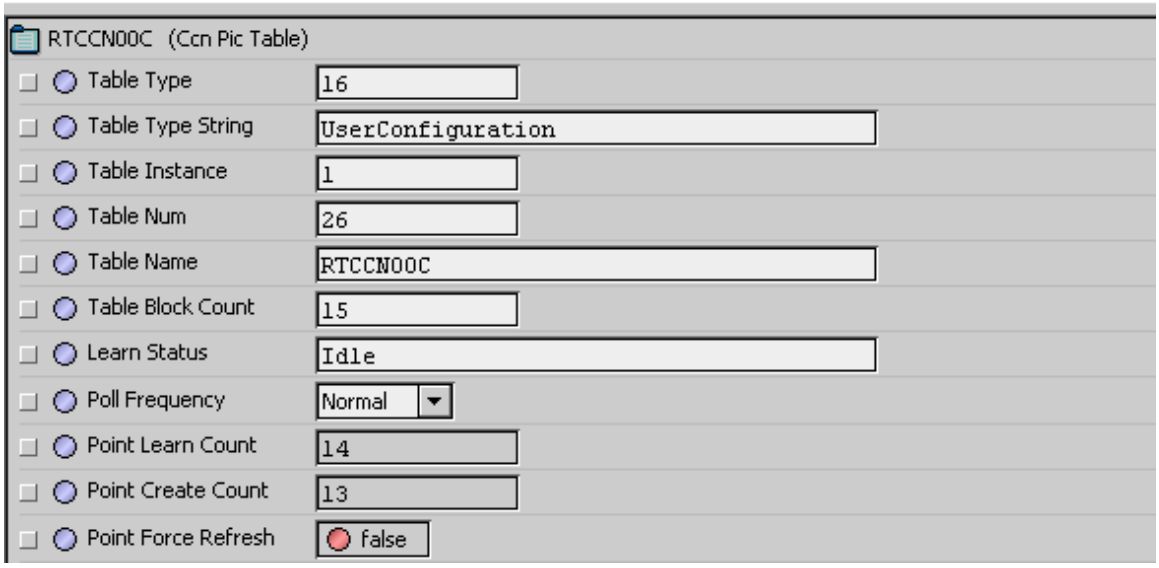


Figure 19: Property sheet for the Ccn PIC table

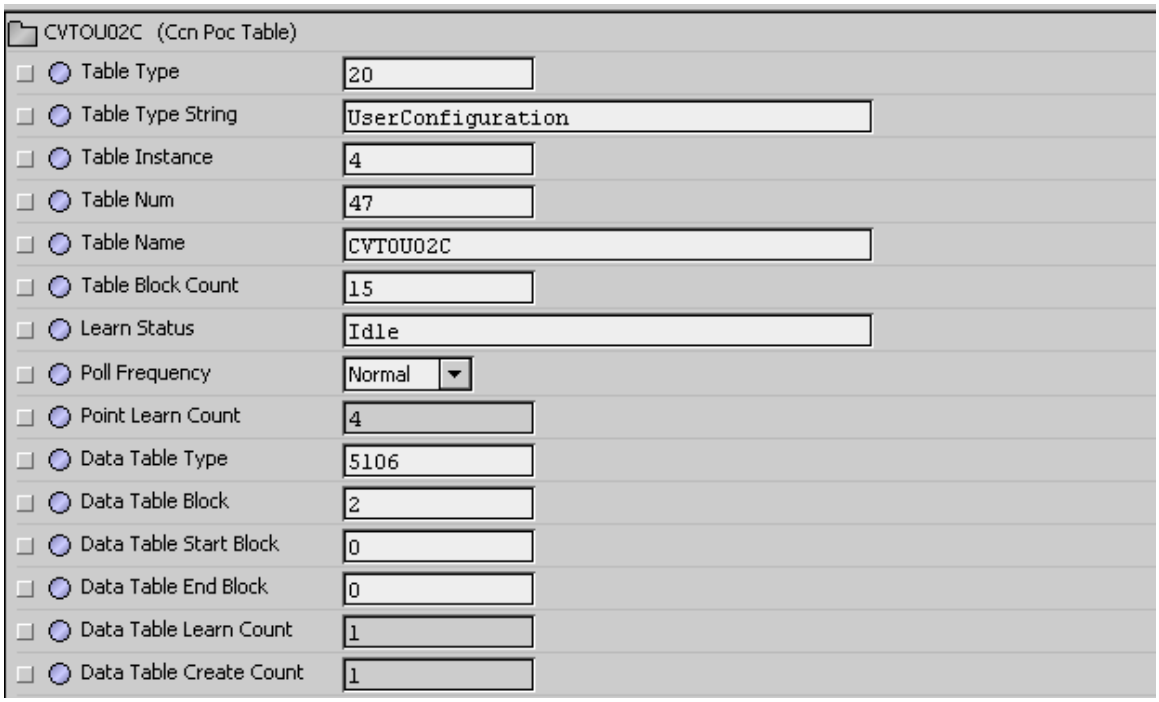


Figure 20: Property sheet for the CCN POC table

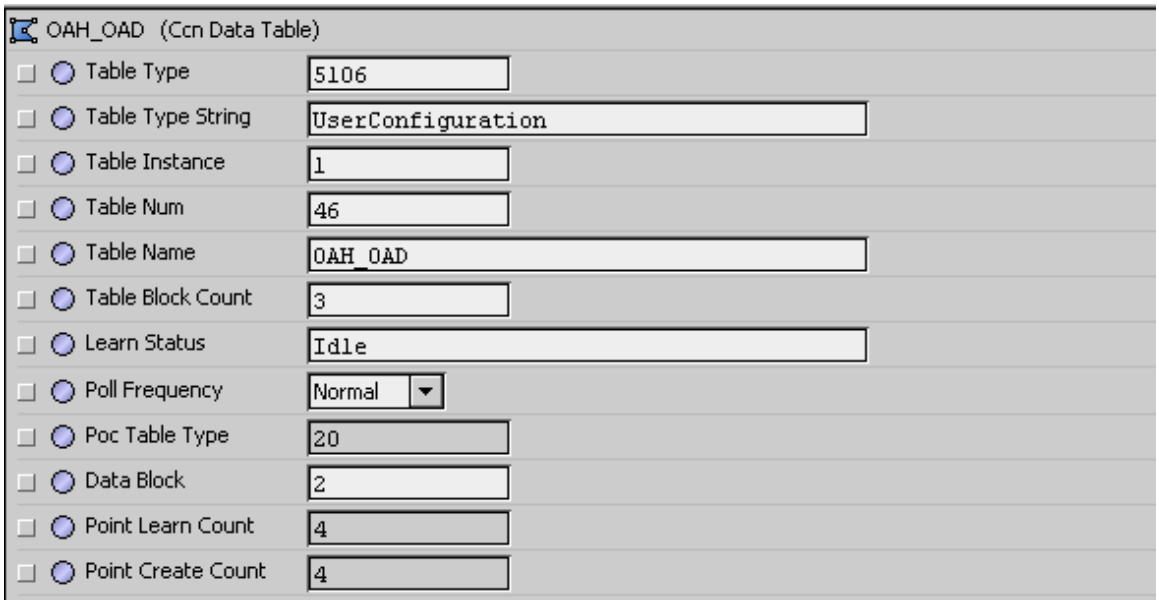


Figure21: property sheet for the CCN Data Table

11.3 CcnTable Actions

Fetch: fetches the additional table related information. Please refer the table Name property from section 11.2

11.3 CCN table addition

12 Ccn Point List Manager

The **Ccn Point List Manager** is the default view when you double-click on “PIC” table which is placed under a CcnTableGroup in the Nav tree. This manager view provides a quick and easy way to display and learn Ccn Points that are on the Ccn PIC table:

The Ccn Point List Manager is a table-based view, where each row represents a unique point. When building a device in the station, you use this view to create, edit, and delete point-level components. Below is an example Ccn Point List Manager View for discovery and adding points to station database.

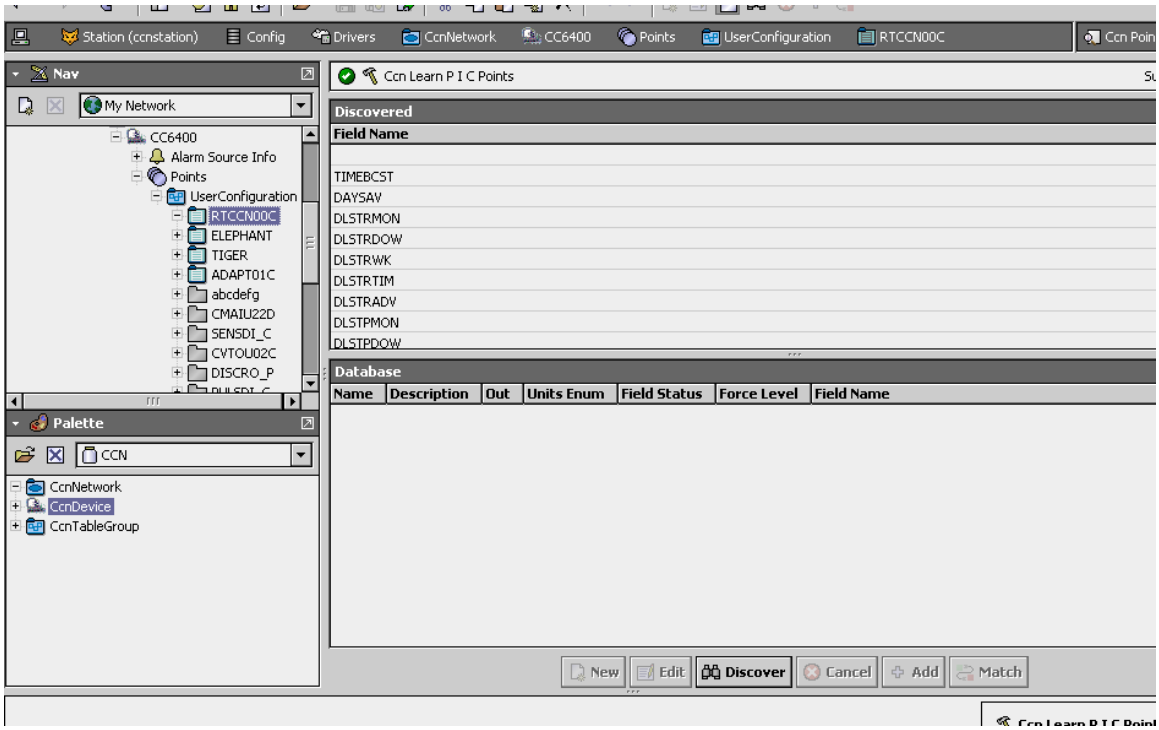


Figure 22: CCN PIC table’s Point discovery

The Ccn Point List Manager consists of either one or two main panes, depending on whether or not the “Discover” button has been clicked. The view above shows a typical Ccn Point List Manager view.

The "New", and "Edit" buttons are not unique to the Ccn Point List Manager, and are explained in the "Niagara AX User's Guide" in the "Driver Architecture" section. The "Match" button is not used for the Ccn driver.

The "Discover" button does implement functionality that is unique and tailored to discovering Ccn points. By clicking the "Discover" button, the "learn" mode of the manager is invoked (the panes will be split, and a "discovery" table will be displayed in the top pane) .

The progress of the discover points process can be viewed from "learn status" from table's property sheet.

Once the discovery job is complete, the top half-pane of the point manager will display a table of points discovered.

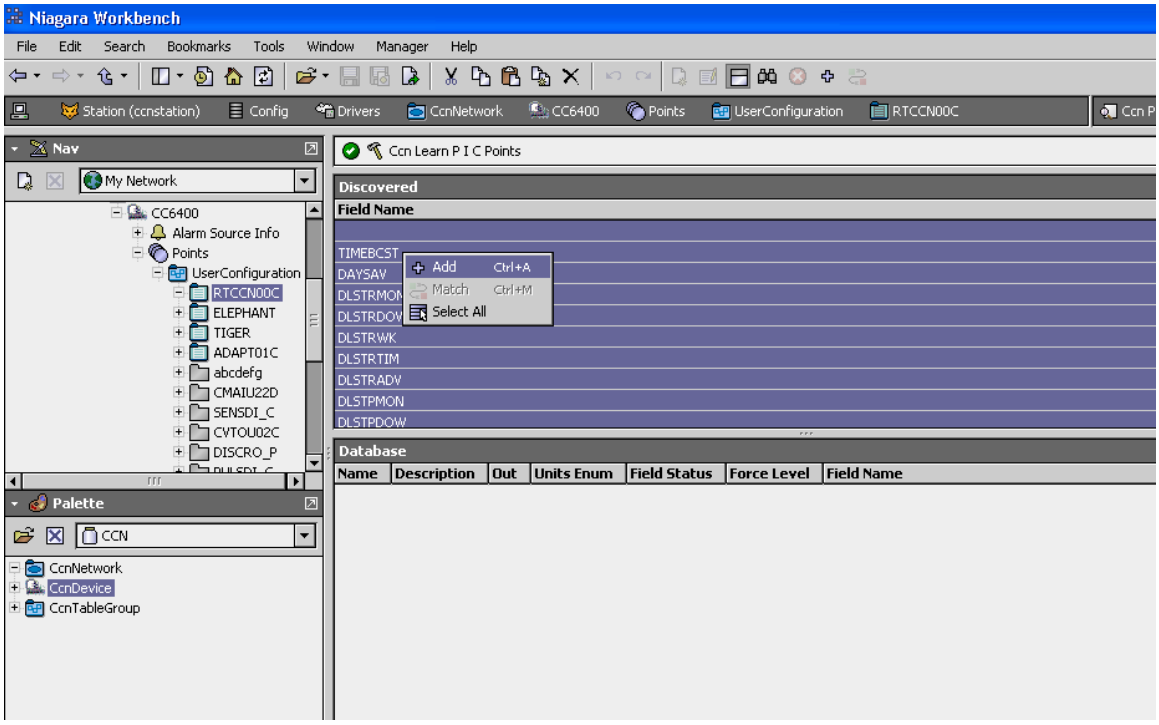


Figure 23: Adding Ccn Points to station database

13 Ccn Data Point List Manager

The **Ccn Data Point List Manager** is the default view when you double-click on "Data" table which is place under a POC table in the Nav tree. This manager view provides a quick and easy way to display and learn Ccn Points that are on the Ccn POC table:

The Ccn Data Point List Manager is a table-based view, where each row represents a unique point. When building a device in the station, you use this view to create, edit, and delete point-level components. Below is an example Ccn Data Point List Manager View for discovery and adding points to station database.

The Ccn Data Point List Manager consists of either one or two main panes, depending on whether or not the “Discover” button has been clicked. The view above shows a typical Ccn Data Point List Manager view.

The “New”, and “Edit” buttons are not unique to the Ccn Point List Manager, and are explained in the “Niagara AX User’s Guide” in the “Driver Architecture” section. The “Match” button is not used for the Ccn driver.

The “Discover” button does implement functionality that is unique and tailored to discovering Ccn points. By clicking the “Discover” button, the “learn” mode of the manager is invoked (the panes will be split, and a “discovery” table will be displayed in the top pane) .

The progress of the discover points process can be viewed from “learn status” from table’s property sheet.

Once the discovery job is complete, the top half-pane of the point manager will display a table of Points discovered.

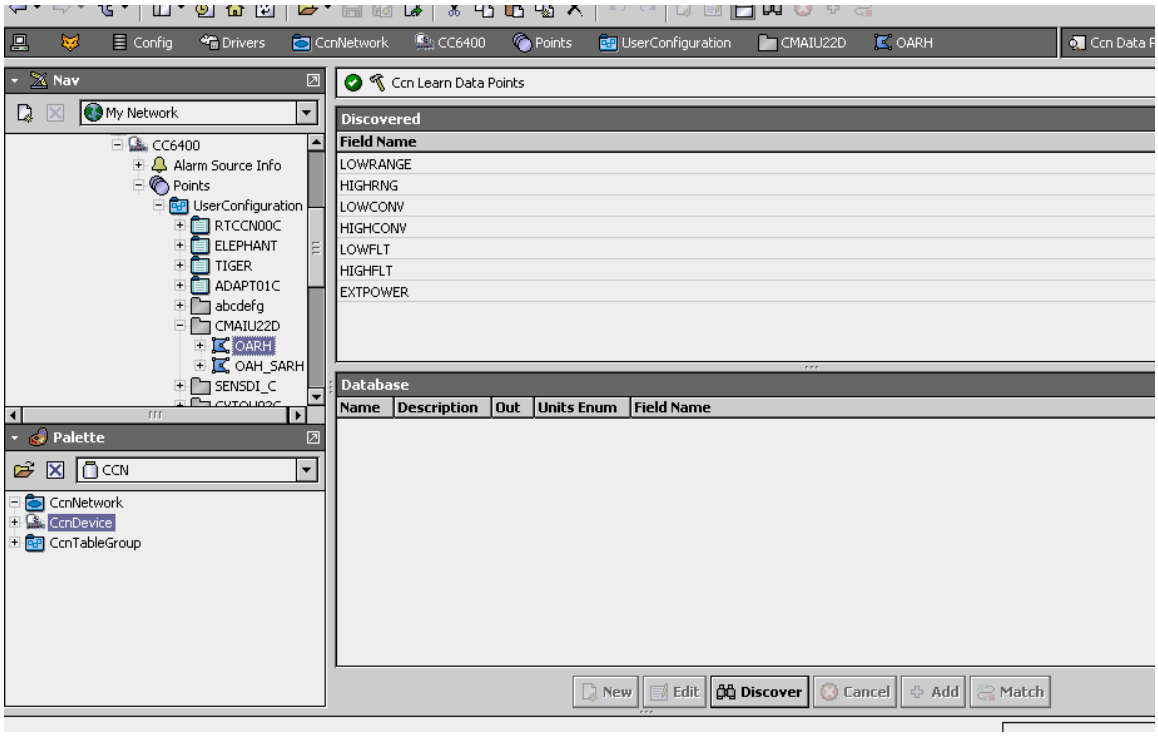


Figure 24: Points discovery on CcnDataTable.

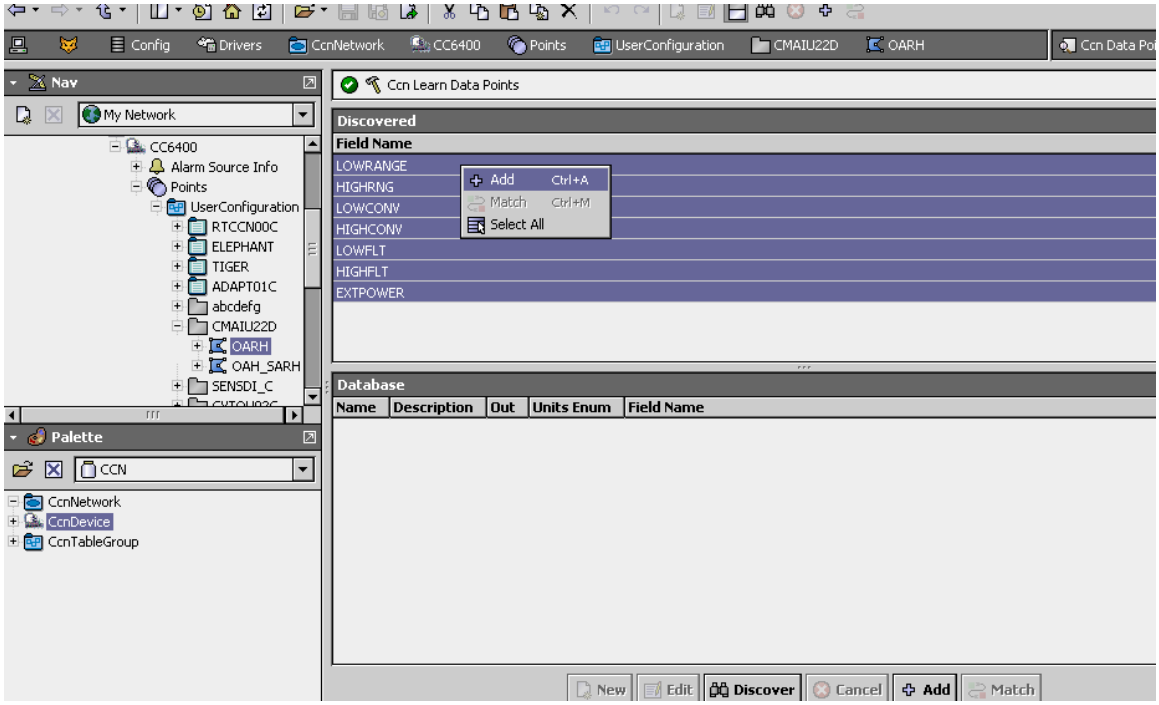


Figure 25: Adding Points to station database.

14 Ccn Alarm History Manager

Ccn alarm history manager is the default view for a alarm history table. It is as follows.

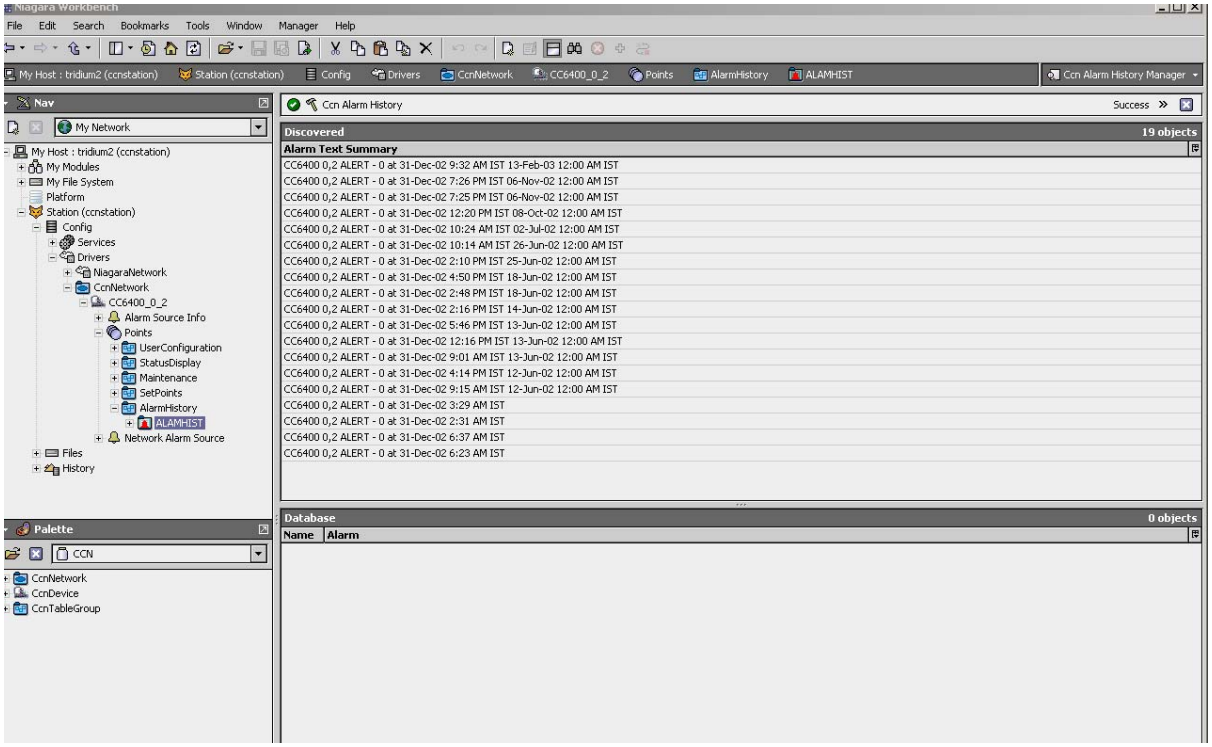


Figure 26 Alarm History Table

15 Ccn Fid Point List Manager

The **Ccn Fid Point List Manager** is the default view when you double-click on FID table which is learnt from an FID type device. This manager view provides a quick and easy way to display and learn Ccn Points that are on the Ccn Fid Table:

The Ccn Fid Point List Manager is a table-based view, where each row represents a unique point. When building a device in the station, you use this view to create, edit, and delete point-level components. Below is an example Ccn Fid Point List Manager View for discovery and adding points to station database.

The Ccn Fid Point List Manager consists of either one or two main panes, depending on whether or not the “Discover” button has been clicked. The view above shows a typical Ccn Fid Point List Manager view.

The “New”, and “Edit” buttons are not unique to the Ccn Fid List Manager, and are explained in the “Niagara AX User’s Guide” in the “Driver Architecture” section. The “Match” button is not used for the Ccn driver.

The “Discover” button does implement functionality that is unique and tailored to discovering Ccn points. By clicking the “Discover” button, the “learn” mode of the manager is invoked (the panes will be split, and a “discovery” table will be displayed in the top pane) .

The progress of the discover points process can be viewed from “learn status” from that particular table’s property sheet.

Once the discovery job is complete, the top half-pane of the point manager will display a table of points discovered.

Figure 27 Point’s discovery on a FID table

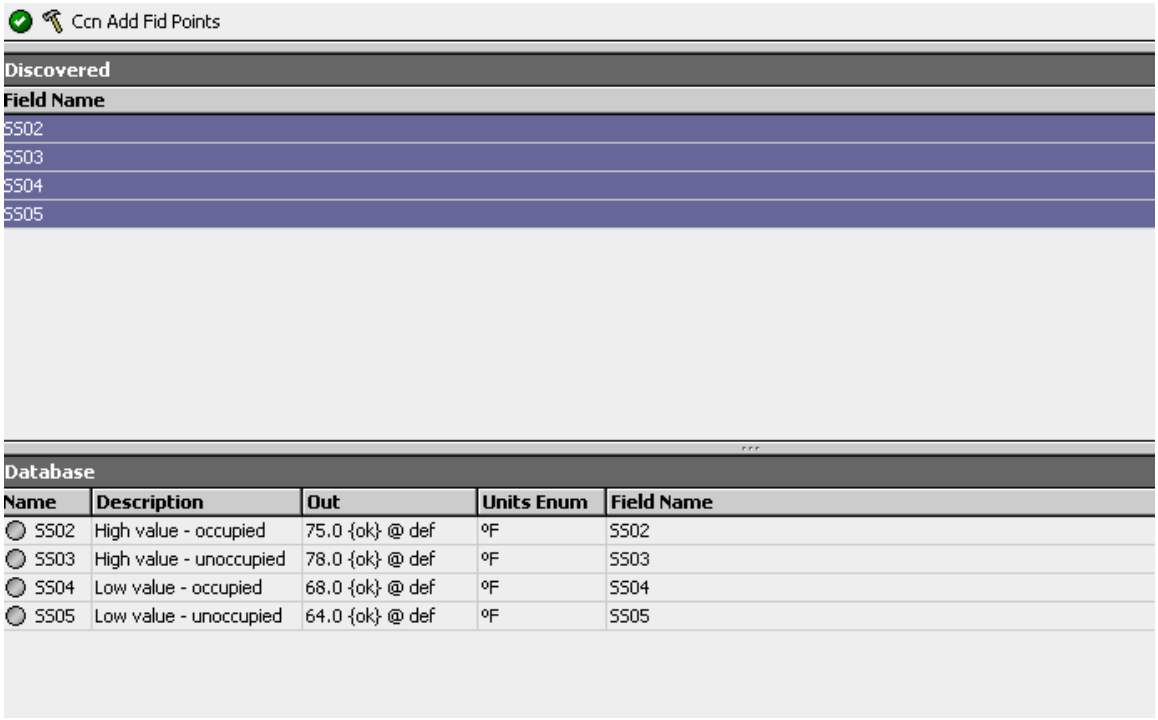


Figure 28 Adding points to station database.

16 Ccn Time Schudule Manager

CcnTimeScheduleManager is a tabular view which will be available on tables of type DataTableWithTimeSchedule or on tables of type FIDTableWithTimeSchedule.From this tabular view user can select/deselect the check boxes available under week days and can change the time under fields “From” and “To”. User can save these values to the controller by using “SaveTimeSchdules” option. The changes will be reflected in Ccn Fid PointList manager.
The changes done in CcnFidPointList manager will be reflected in CcnTimeScheduleManager and vice versa.
The screen shot for Ccn Time schedule Manager is as follows.

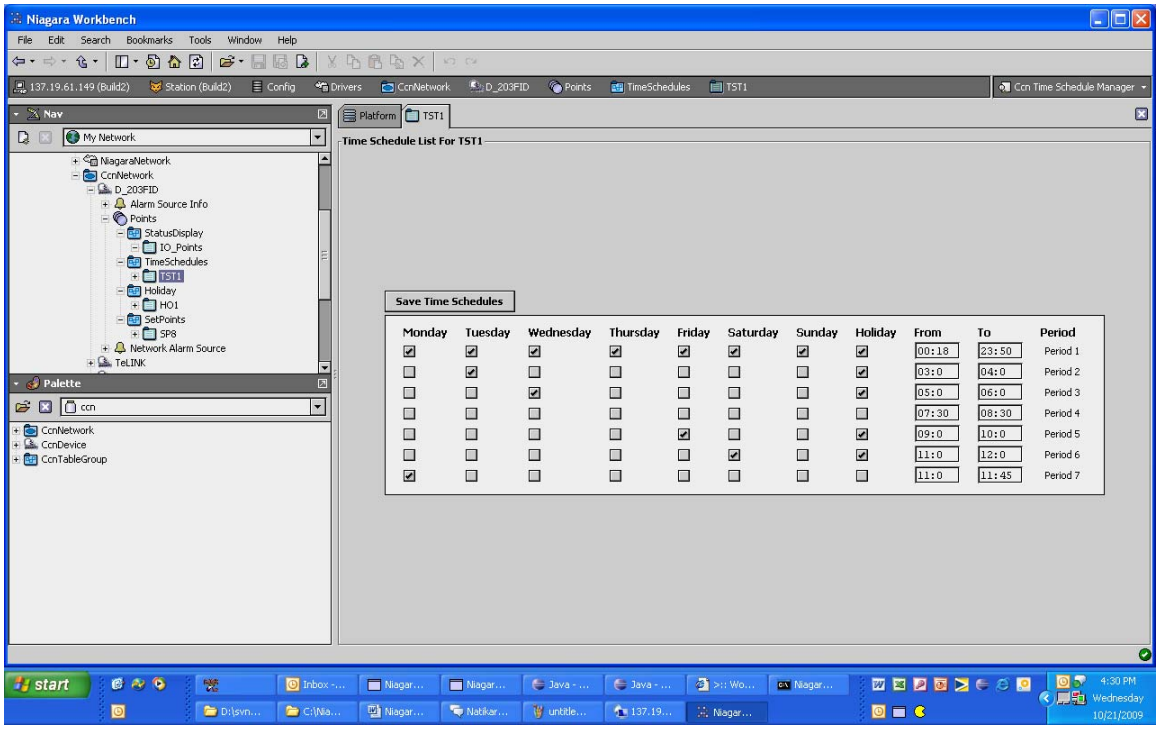
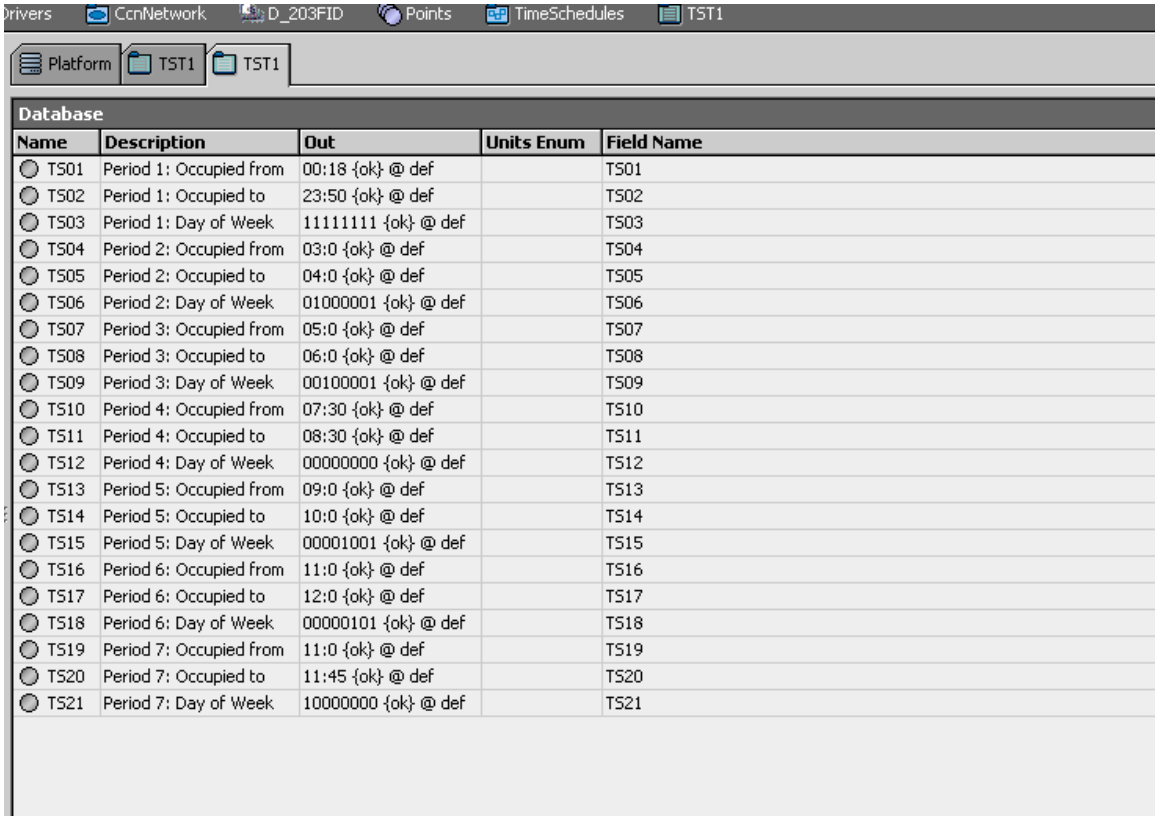


Figure 29: Ccn Time Schedule Manager



Name	Description	Out	Units Enum	Field Name
TS01	Period 1: Occupied from	00:18 {ok} @ def		TS01
TS02	Period 1: Occupied to	23:50 {ok} @ def		TS02
TS03	Period 1: Day of Week	11111111 {ok} @ def		TS03
TS04	Period 2: Occupied from	03:0 {ok} @ def		TS04
TS05	Period 2: Occupied to	04:0 {ok} @ def		TS05
TS06	Period 2: Day of Week	01000001 {ok} @ def		TS06
TS07	Period 3: Occupied from	05:0 {ok} @ def		TS07
TS08	Period 3: Occupied to	06:0 {ok} @ def		TS08
TS09	Period 3: Day of Week	00100001 {ok} @ def		TS09
TS10	Period 4: Occupied from	07:30 {ok} @ def		TS10
TS11	Period 4: Occupied to	08:30 {ok} @ def		TS11
TS12	Period 4: Day of Week	00000000 {ok} @ def		TS12
TS13	Period 5: Occupied from	09:0 {ok} @ def		TS13
TS14	Period 5: Occupied to	10:0 {ok} @ def		TS14
TS15	Period 5: Day of Week	00001001 {ok} @ def		TS15
TS16	Period 6: Occupied from	11:0 {ok} @ def		TS16
TS17	Period 6: Occupied to	12:0 {ok} @ def		TS17
TS18	Period 6: Day of Week	00000101 {ok} @ def		TS18
TS19	Period 7: Occupied from	11:0 {ok} @ def		TS19
TS20	Period 7: Occupied to	11:45 {ok} @ def		TS20
TS21	Period 7: Day of Week	10000000 {ok} @ def		TS21

Figure 30 Ccn Fid Point List Manager

17 Ccn Points

The collection of CCN shadow point objects model the real and internal I/O as well as selected internal modules of a CCN controller.

The following shadow objects are provided.

Type	***Behavior***	***Where it is valid***
CcnInputProxy	▪ Models a single Input Point defined by field index and field name in the table. ▪ An Input Point is one that is not forceable or writeable.	▪ under CcnPicTable types 11H and 12H (applies to non-forcible points)
CcnOutputProxy	▪ Models a single foceable Output Point defined by field index and field name in the table. ▪ An Output Points is one that is forceable.	▪ under CcnPicTable types 11 H and 12H (applies to forcible points),

	▪ The user can select the Force and Auto commands. Or ▪ Models a single non-forceable Output Point defined by field index and field name in the table. ▪ A Non-forceable Output Point is one that is not forceable, but is settable. ▪ The user can select the setValue command.	▪ under CcnPicTable types 10H and 13H, or 17H ▪ under CcnDataTable types that are under CcnPocTable types 14H, 16H, or 18H
CcnFidOutputProxy	▪ Models a single Output Point defined by field index and field name in the table. ▪ An Output Points is one that is forceable. ▪ The user can select the Force and Auto commands.	▪ under CcnFidTable types 501H

17.1Creating and Configuring the CcnObject

A CcnObject can only be added during the CcnPicTable, CcnDataTable's or CcnFidTable PointListManager addition process

17.2 Ccn Object Properties

fieldIndex — CcnPicTable and CcnDataTable can have up to 60 points with field Index ranging from 0-59

Fid IO_ Points Tables can have up to 64 points with field Index ranging from 0-63

Fid Set point Tables can have up to 4 points with field Index ranging from 0-3

Fid Time Schedule Tables can have up to 21 points with field Index ranging from 0-20

Fid Holiday Tables can have up to 60 points with field Index ranging from 0-59

fieldName — this point's name (8 ASCII characters)

Fid IO_Points Tables has up to 64 points. Each point's name can be modified from Niagara by changing it from the property sheet and invoke "fetch" action.

dataType Point's data type (00 – 33H).

dataTypeEnum Point's data type enumeration.

0, "eightBitFlags"
1, "unsignedChar"
2, "unsignedInt"
6, "BEST_FloatingPoint"
7, "IEEE_FloatingPoint"
9, "signedChar"
10, "signedInt"
12, "timeInTwoBytes"
16, "Name"
17, "BCD"
18, "controllerName"
19, "controllerName"
20, "controllerName"
21, "controllerName"
22, "pointName"
23, "pointName"
24, "pointName"
25, "schedulePointNo"
26, "schedulePointNo"
27, "schedulePointNo"
28, "schedulePointNo"
29, "schedulePointNo"
30, "schedulePointNo"
31, "schedulePointNo"
32, "phoneNumber"
33, "password"
34, "ASCII"
48, "linkedFloatingPointValue"
49, "numberOfDecimalPlaces"

50, "numberOfDecimalPlaces"

51, "doubleTimeInFourBytes"

displayType — Display type per the point format information from the device. True means Metric, False means Imperial. All data values in the devices are stored in Imperial. We do not use this property, but instead use the global property on the CcnNetwork Config tab named displayMetric.

displayDigits — Point's display digits requirements. The upper nibble is the number of digits to the left of the decimal, and the lower nibble is the number of digits to the right of the decimal.

For dataType 0 ("eightBitFlags") the upper nibble specifies the number of usable bits in the byte (right to left).

This value is displayed in decimal and must be converted to hexadecimal to be interpreted (for instance a 97 decimal is a 61 hex and thus up to 6 digits to the left of the decimal and 1 digits to the right will display).

fieldByteCount — Point's byte count in the table value block

discreteTextOffset — Point's discrete text offset if it's discrete flag is set.

configFlags — Point's config flags. Valid values are:

bit 0 – this point has a low limit

bit 1 – this point has a high limit

bit 7 – this point is a discrete point

This value is displayed in decimal and must be converted to hexadecimal to be interpreted. For instance, a -128 decimal is an 80 hex and thus it is a discrete point but does not have a low or high limit. Another common value, a -125 decimal is an 83 hex and thus it is a discrete point that does have a low and high limit.

units — Point's integer units value

unitsEnum — Point's integer units enumeration. See Appendix 1 for valid values.

valueBlock — Point's value block assignment.

valueBlockOffset — Point's value block offset assignment.

loLimit — Point's lo limit value.

loLimitBlock — Point's lo limit block assignment.

loLimitBlockOffset	Point's lo limit block offset assignment.
hiLimit	Point's hi limit value.
hiLimitBlock	Point's hi limit block assignment.
hiLimitBlockOffset	Point's hi limit block offset assignment.
variableNo	Point's variable number (only applies to points under 11H, 12H, and 501H tables) .
description	Point's 24 character description.
forceableFlag	Point's forceableFlag. ForceableFlag is False for a CcnInput and a CcnNonForceableOutput ForceableFlag is true for a CcnOutput (if the point is in a 11H, 12H, or 501H table type, and the point has a hiLimit value and the point has a non-zero variableNo). CcnOutput's with forceableFlag = True can be controlled with Force and Auto commands. ForceableFlag is false for a CcnOutput (otherwise). CcnOutput's with forceableFlag = False can be written with the Set command.

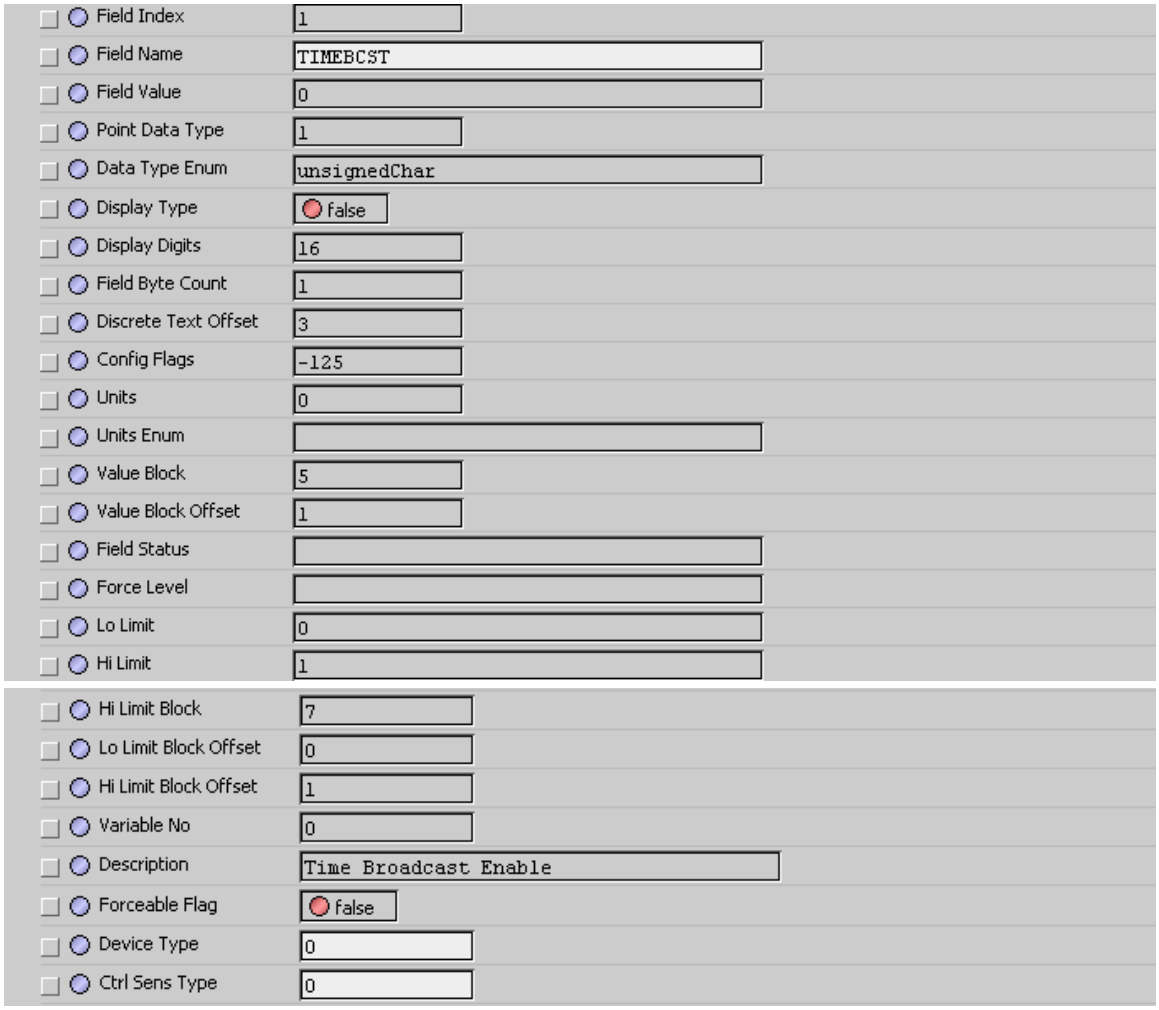


Figure 31: CcnObject or point's property sheet

Note: "Device Type" and "Ctrl Sens Type" properties are not used. They meant for FID device.

18 Actions on CcnObject

Following actions are available on CcnObject depend upon the type of the CcnObject.
A CcnObject can be any of the above three types mentioned earlier.

18.1 Set Command

Non-forcible CcnObject can be written with the set command.A point value set command can be performed by right clicking on the CcnObject and select Actions->Set command.
To do this first the CcnObject should be added to station database.
We can set a value from PointListManager or we can do the same from wire sheet.
If the value given by user is with in the limits then the new value will be written to the field device.

18.2 Override Command

If a CcnOutput object is a discrete point type it can be forced on (value of 1, active text defined by the one's value of the discreteTextOffset text pair). It can be forced off (value of 0, inactive text defined by the zero's value of the discreteTextOffset text pair).

The Ccn Driver manages two force levels (level 4 is used for commands, level 8 is used for links) and the auto level (0). The command level force is the highest priority available from the Ccn Driver.

If CcnOutput object is a discrete point type, the command will open a combo box which will have Force On (Discrete on Text) and Force Off (Discrete off Text) options. Selecting either of these commands will result in a Force command being issued. Following successful completion of the Force command, the value field(s) of the Point Entry and CcnOutput object will reflect the new value. The Entry from the PointListManager will change to lavender color.

A point value Force command can be performed by right clicking on the CcnObject and select Actions->Override command.
To-do this, the CcnObject should be added to station database.
We can override a value from PointListManager or we can do the same from wire sheet view. .

Observation: Some of the points are not overriding properly. The same behavior is observed in R2.

18.3 Auto Command

The CcnOutput objects can be autoed. The auto level command can remove the force level command.

Following successful completion of the Auto command, the value field(s) of the Point Entry and CcnOutput object will reflect a new value.

A point value Force command can be performed by right clicking on the CcnObject and select Actions->Auto command.
Todo this, the CcnObject should be added to station database.
We can override a value from PointListManager or we can do the same from wire sheet view.

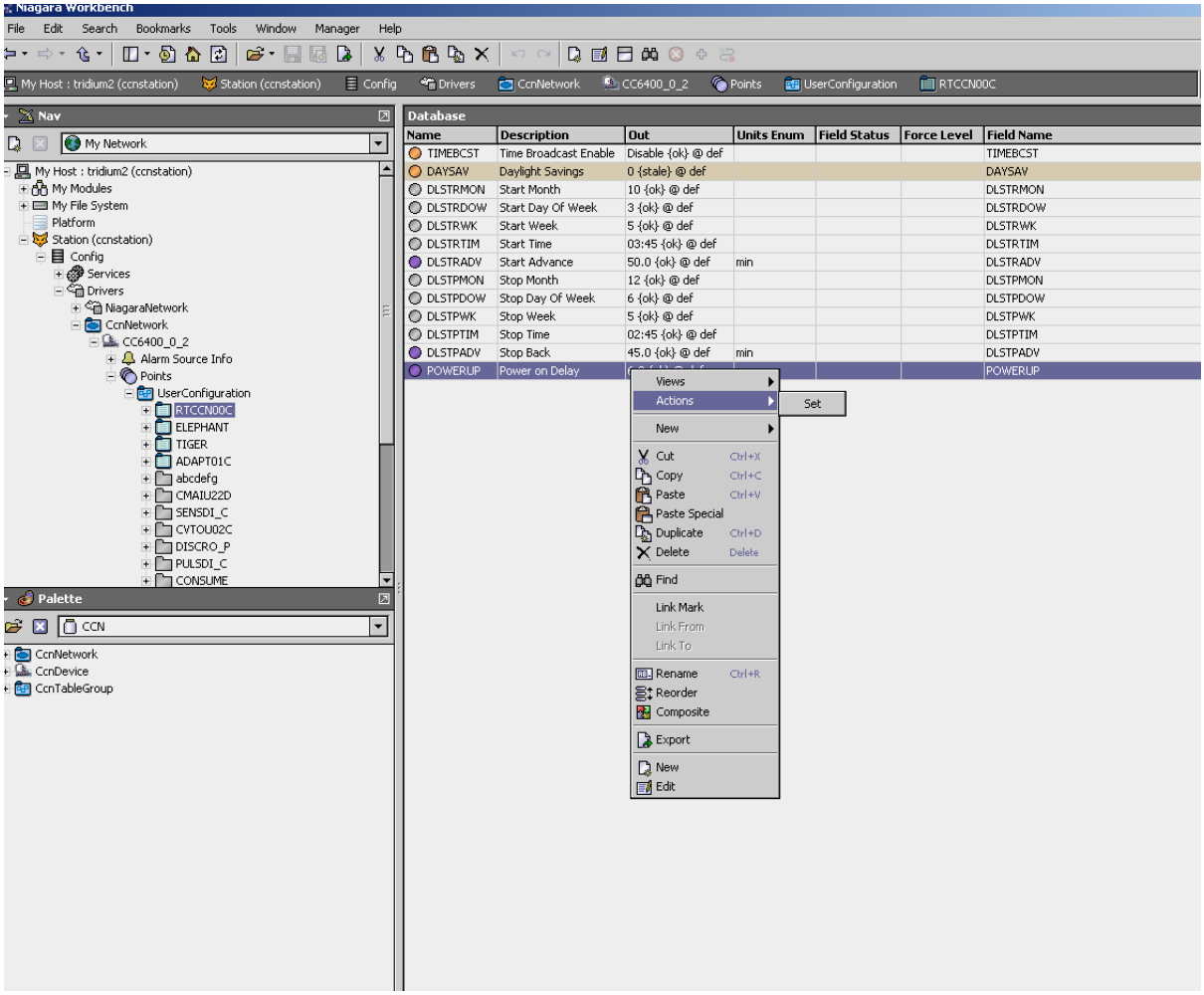


Figure 32 Screen for point write

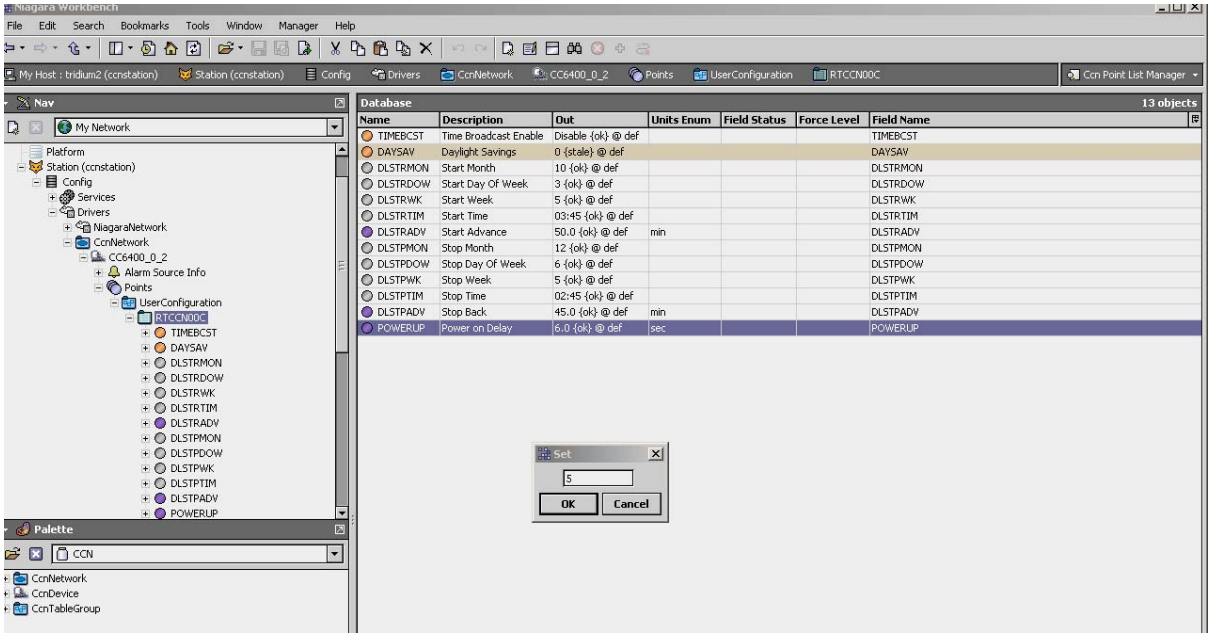


Figure 33 giving a new value for point write

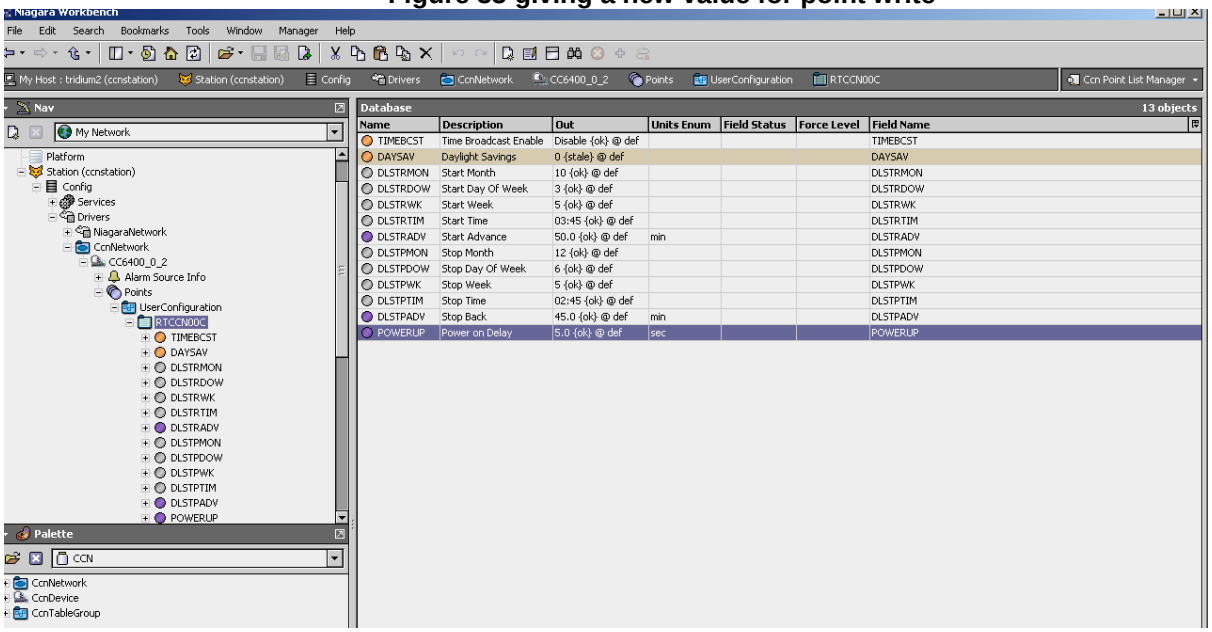


Figure 34 after point writing

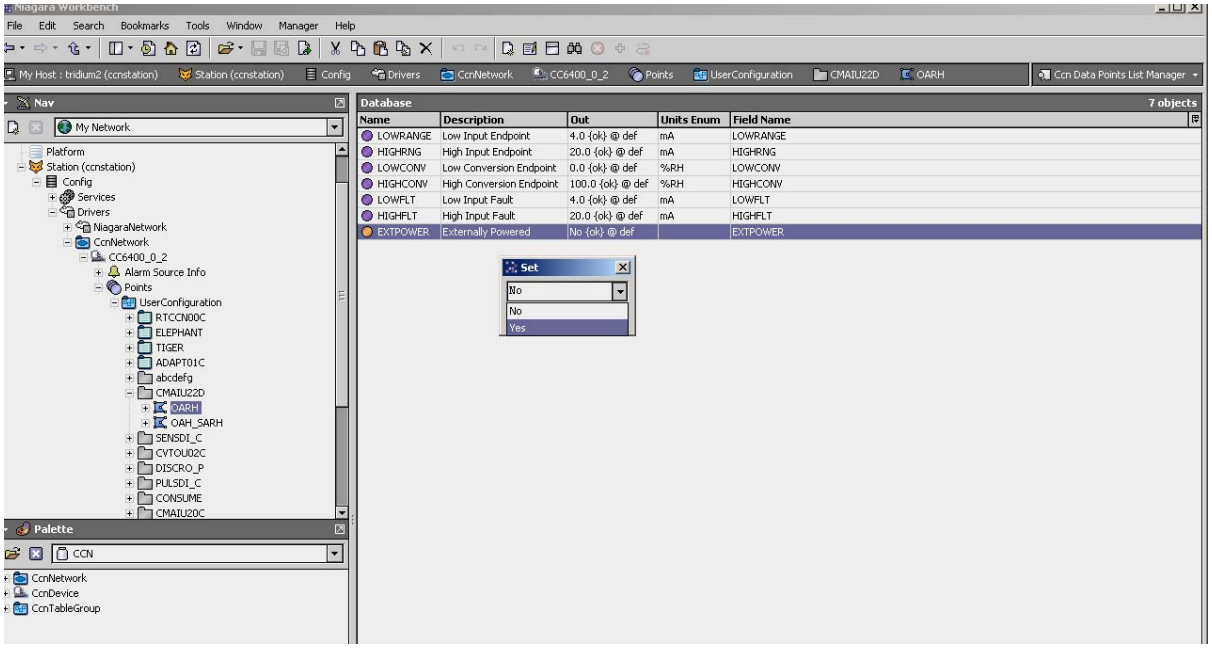


Figure 35 Data table point write

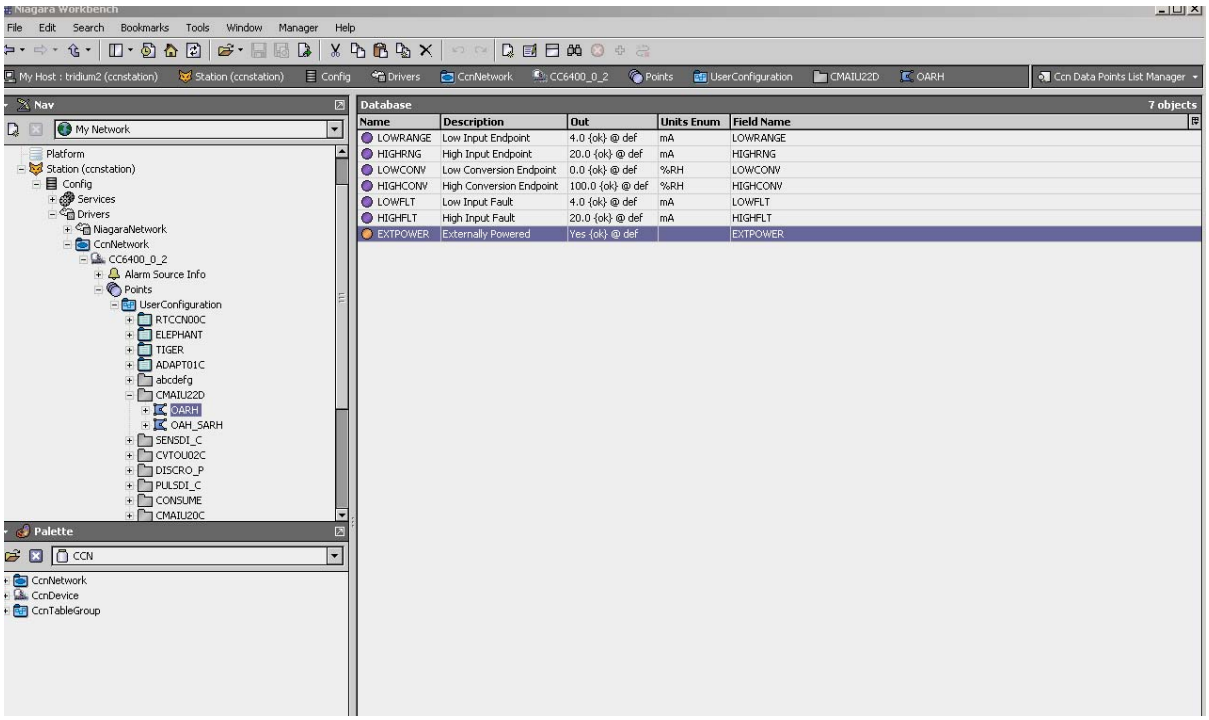


Figure 36 after point write

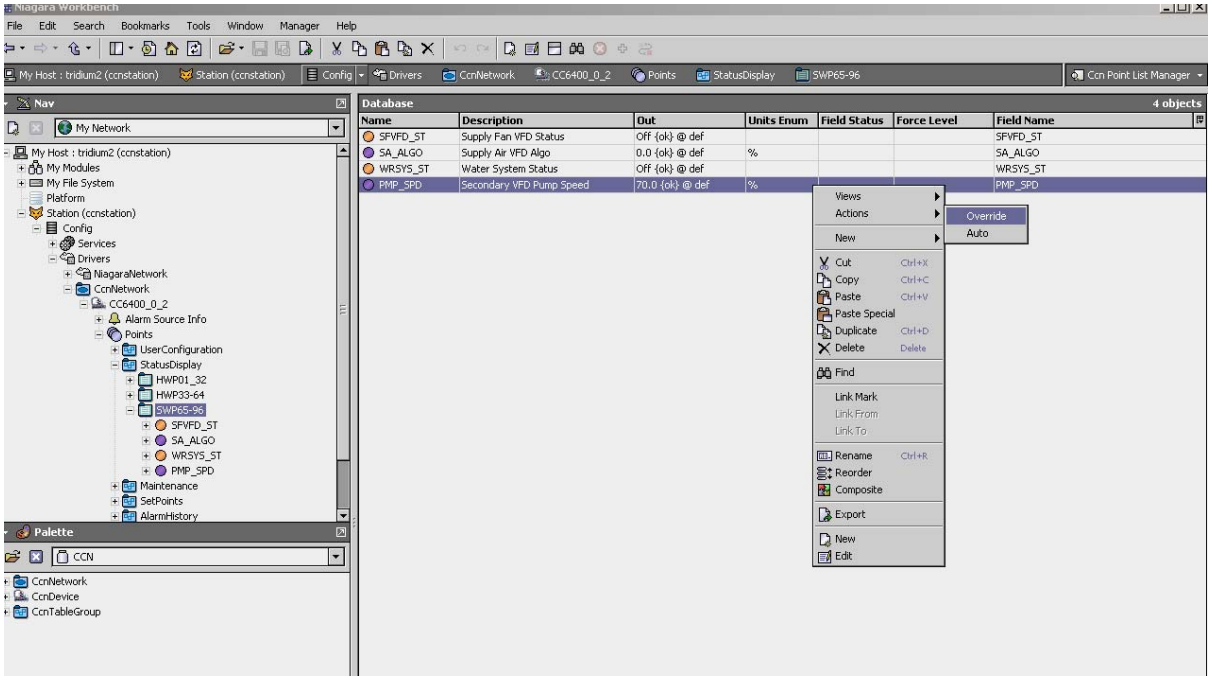


Figure 37 overriding a value to the point

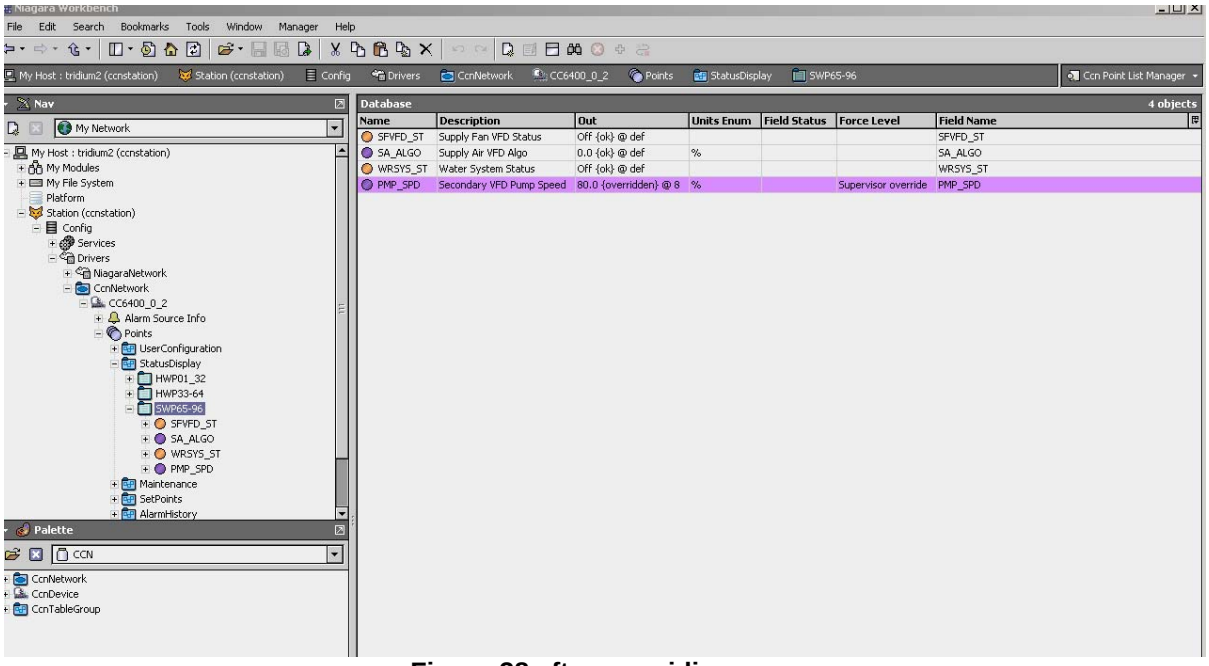


Figure 38 after overriding

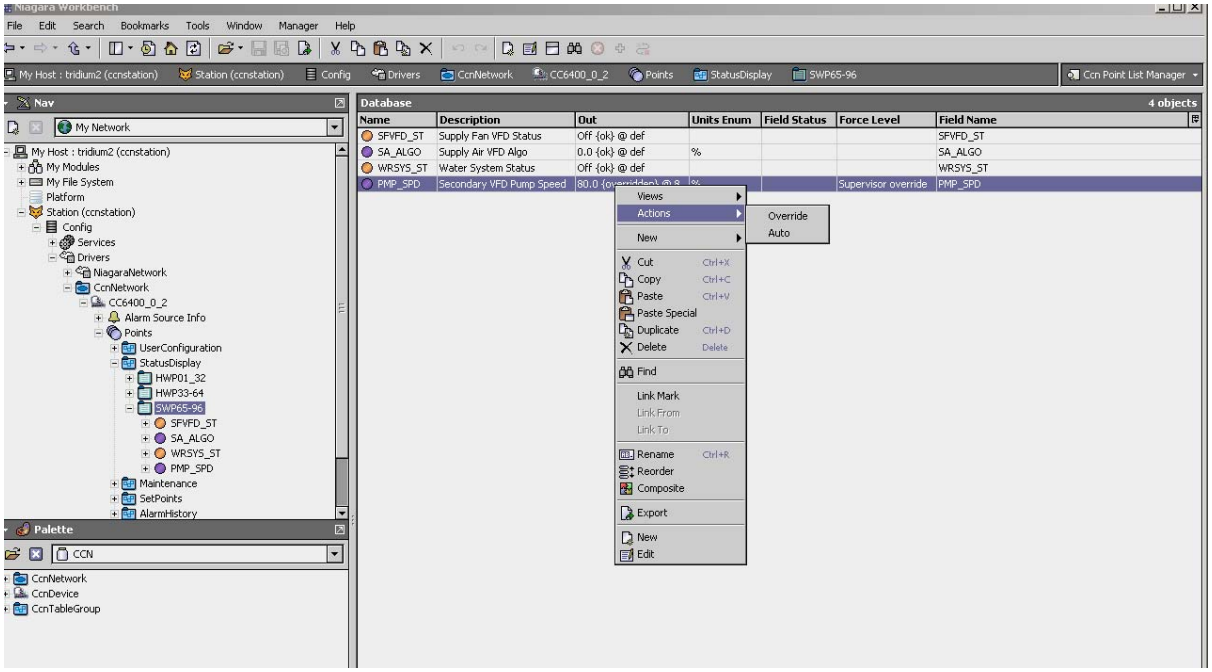


Figure 39 Auto operations on overridden point

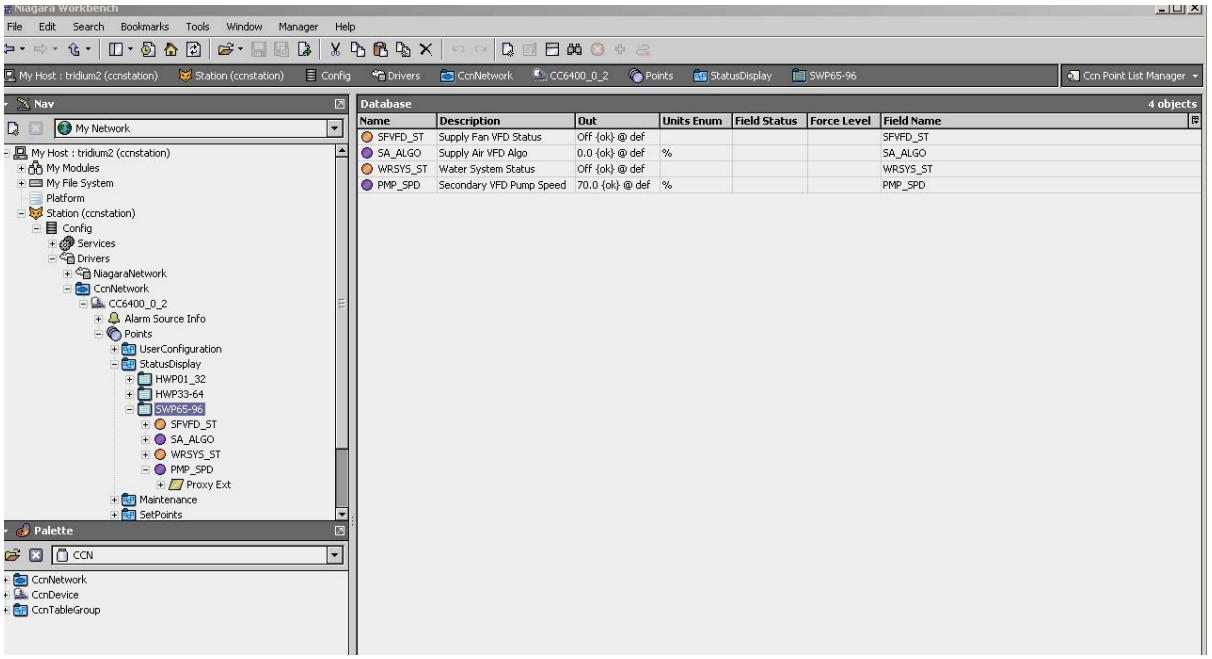


Figure 40 after auto

19 Table Polling

In CCN driver, Polling will happen on Table level. CcnPicTable and CcnDataTable objects become registered to poll when they are in view. The tables which are in view will be polled

as per poll frequency. The default frequency is the “Normal” frequency and the user can change the frequency duration.

20 CCN Device Upload

A CcnDevice’s CcnPicTables, CcnPocTables, CcnDataTables and CcnFidTables can be uploaded. The upload command is available as an action on the CcnDevice. When invoked, a list of CcnTable blocks are uploaded and all Station resident data is updated to match that which was retrieved from the field device.

21 CCN Device Download

A CcnDevice’s CcnPicTables, CcnPocTables, CcnDataTables and CcnFidTables can be downloaded. The download command is available as an action on the CcnDevice. When selected, each non-real-time table’s value blocks are constructed from the Station resident data and then downloaded to the field device.
Note: If download the logic to the controller, we don’t have clarity on whether the device will work or not. So we couldn’t test this feature

22 Other Ccn Utility Functions

22.1 CCN Alarm Acknowledger

The Station can be designated as the CCN Alarm Acknowledger.

To do this, select the “alarmAcknowledger” property to “true” from the Network’s property sheet

22.2 CCN Broadcast Acknowledger

The Station can be designated as the CCN Broadcast Acknowledger.

To do this, select the “broadCastAcknowledger” property to “true” from the Network’s property sheet

22.3 CCN Time Broadcaster

The Station can be designated as the CCN Time Broadcaster.

To do this, first select the “timeBroadcaster” property to true from CcnNetwork’s property sheet .

When designated as the time broadcaster, the JACE will:

- Broadcast date and time onto the CCN whenever the time in the JACE changes in excess of three minutes.
- Broadcast date and time daily at 1:00 AM and 1:00 PM on the JACE clock.
- Broadcast date and time whenever a time broadcast request is received from the CCN.

23 ComfortWorks Tunneling Through JACE

Tunneling is the process whereby a ComfortWorks station can access a remote CCN to which a JACE is connected over RS485. The ComfortWorks station and the JACE must be able to connect to each other over IP; they use UDP to communicate. The JACE uses the same ports as those used by the CCN Gateway / CCN Bridge hardware devices. Please refer to Carrier's documentation of the CCN Gateway if you need specific information about which ports are used.

Here are the steps required to tunnel a Comfort Works station. This assumes a JACE is connected to a CCN over RS485 and running a station with the Ccn driver installed. This also assumes that Comfort Works is installed on a PC that has access to the JACE over an Ethernet connection.

1. Enable tunneling in the JACE.
    a. Open the CCN station in Workbench.
    b. Visit the property sheet of the CcnNetwork.
    c. Check the tunnelEnable property.
    d. Confirm that your JACE station has a different CCN address from Comfort Works (usually Comfort Works is addressed as 0, 239)
2. Configure a ComfortWorks station to connect using Local-Direct Connection (CCN/Ethernet Gateway).
    a. Launch Carrier Network Manager
    b. To use existing CCN database in ComfortWorks: From the System Overview window right click an existing CCN. Choose Modify… The Modify CCN Definition dialog should appear.
    c. To create new CCN database in ComfortWorks: From the System Overview window right click somewhere in the empty space. Choose New. Then choose Carrier Comfort Network (CCN). Enter a name in the New CCN Definition dialog that appears.
    d. Click the Access… button. This should take you to the CCN Access Definition dialog.
    e. For Method (Towards the top of the dialog), choose Local-Direct Connection (CCN/Ethernet Gateway)
    f. Then the CCN/Ethernet Gateway IP address field (somewhere below the Method field) should become enabled. Please enter the IP address of JACE in this field.
    g. Click OK at the CCN Access Definition dialog.
    h. Click OK at either the New or Modify CCN Definition dialog.
    i. At this point, Comfort Works should be automatically connected to the CCN through the JACE.
    j. Because CcnTunnel is enabled, the JACE maintains a routing table of all CCN devices that report in. Those devices (like the Comfort Works application only report in every 5 minutes, so give the JACE a little time to build it's routing table). No harm done if you try commands early, they just might not work for a few minutes.

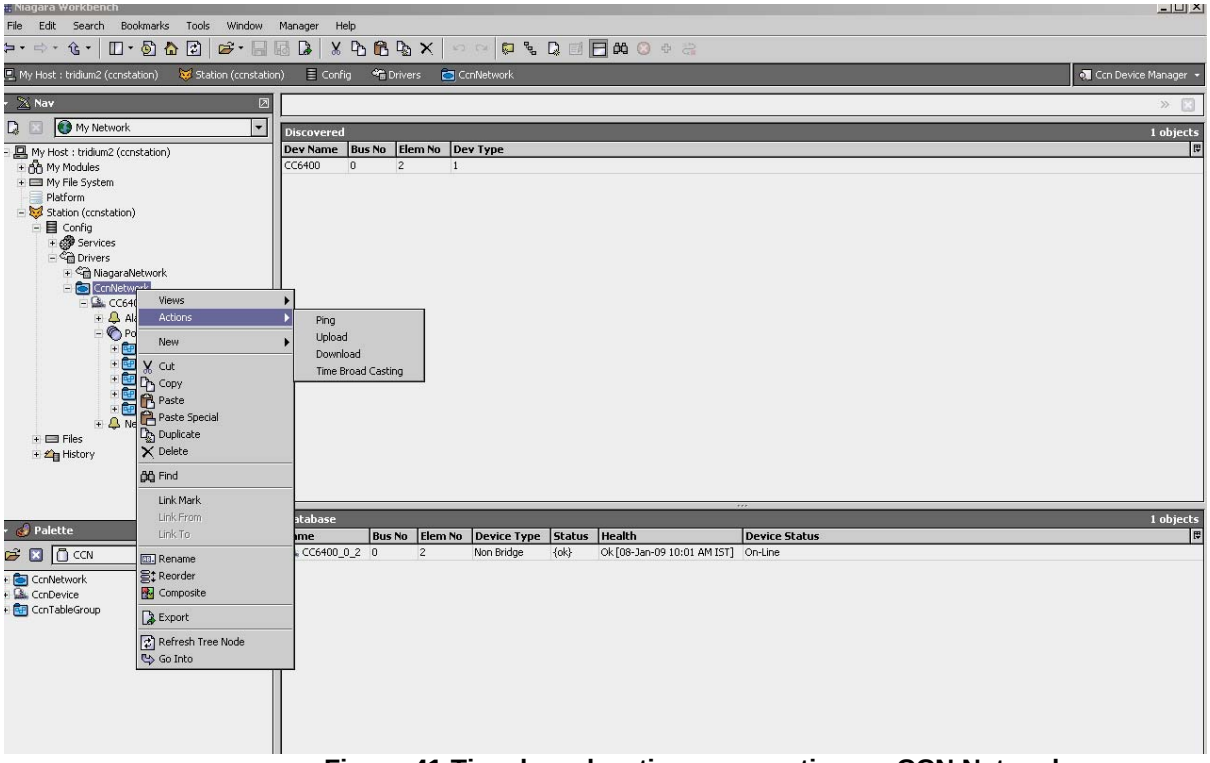


Figure 41 Time broadcasting as an action on CCN Network

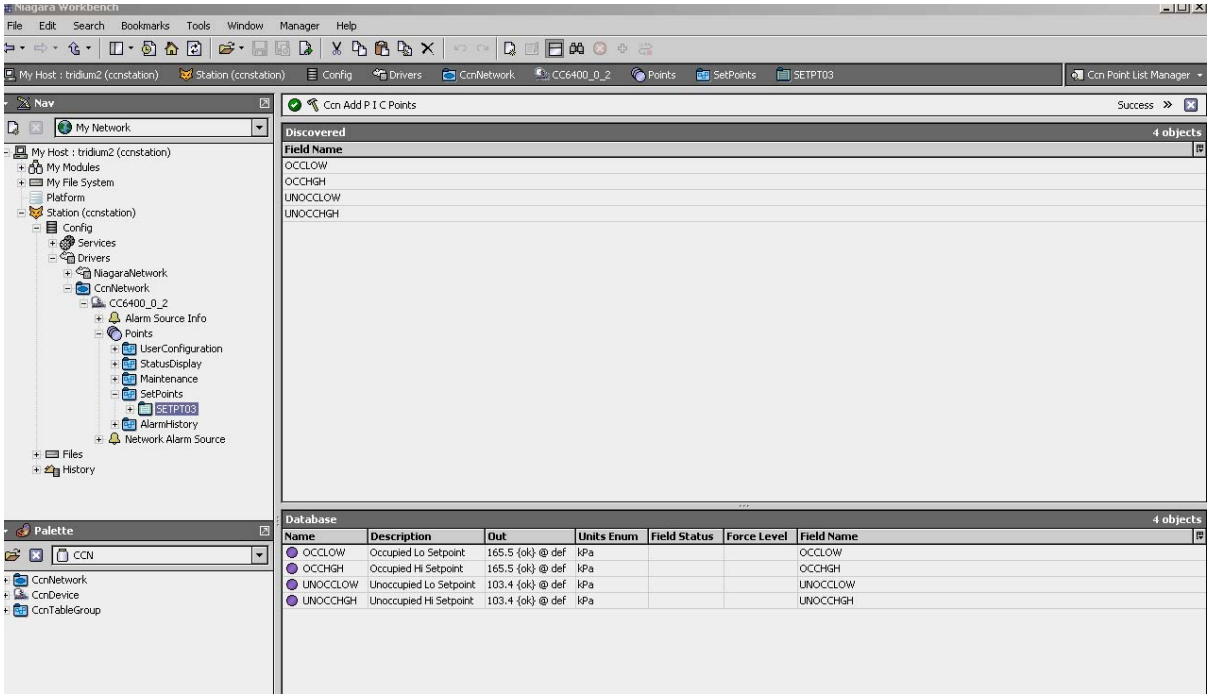


Figure 42 Point display when displaymetric true(from network property sheet)

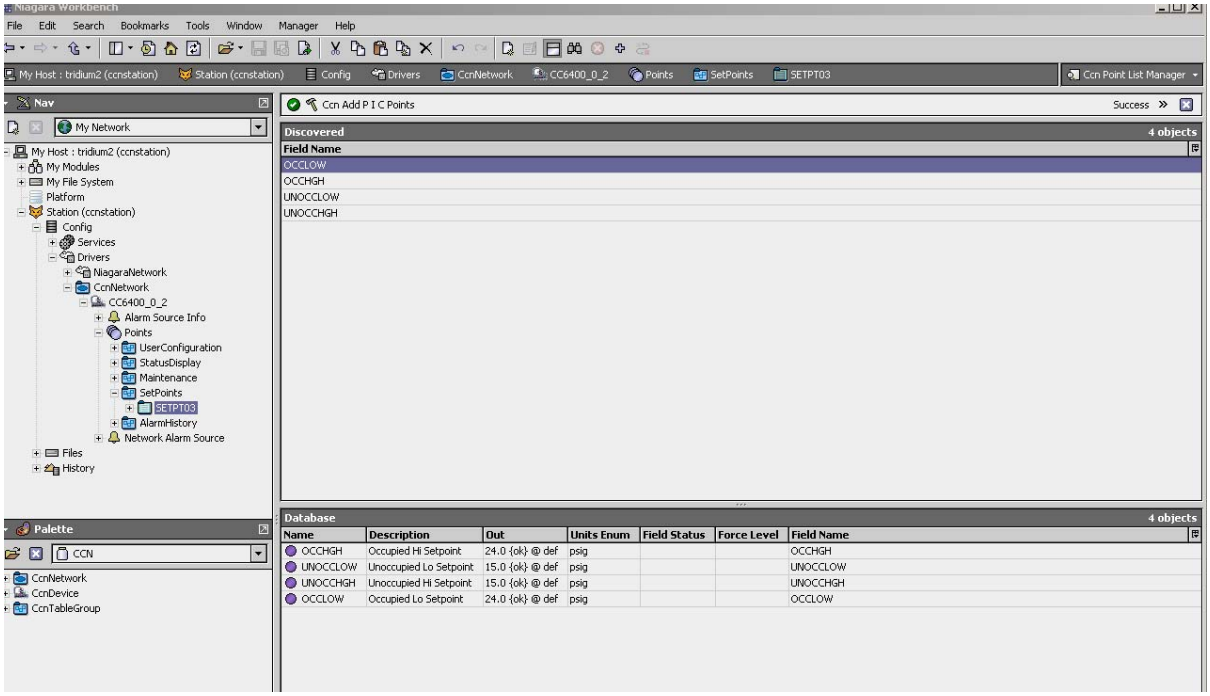


Figure 43 Point display when displaymetric is false

Observation: On changing of display metric property sometimes units are not changing until user does workbench refresh.

23 Limitations/Changes made to AX CCN driver

1. For time related CCN points, the user should give value in hh:mm format to set a new value. The driver doesn't show any error message on UI side. But it will be thrown in console side.
2. Testing is not performed for the following functionality checks.
    1. Alarm Acknowledgement
    2. Time Broadcasting and broadcast Acknowledgement
    3. Driver force levels.
    4. Tunneling is supported. The features of upload/download options from Comfort View tool are not tested for JACE.
    5. Driver supports a single ccn network per station and is tested with single network trunk per station. It is not tested on 2 comm. ports of a JACE.

24 Performance

Niagara AX driver is tested in Win XP [soft JACE], JACE-6

Soft JACE

[System configuration]

RAM	2 GB
Hard Disk	80 GB
Speed	2.33 GHz

JACE-6
[System configuration]
Power PC 440 524 MHz processor
128 MB DDR RAM& 128 MB Serial Flash
Optional 256 MB DDR RAM

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